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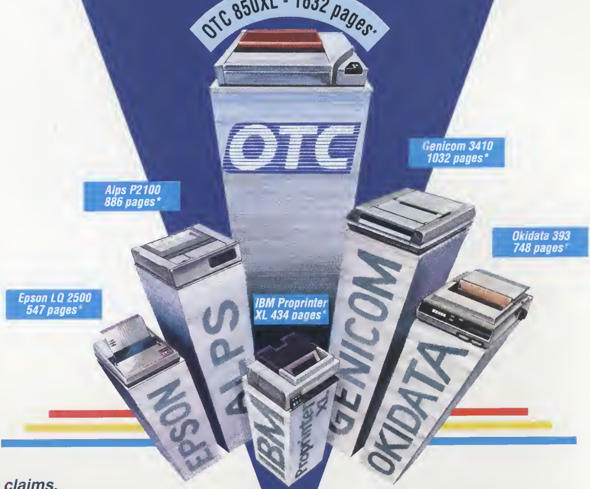

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CIRCLE 111 ON READER SERVICE CARD

LOTUS

2 **STAFF LETTER**

3 **LETTERS**

6 **IDEAS & TRENDS**
A First Look at *1-2-3/G*
Also: *Windows* and OS/2, Comdex, Laptop Links, Interview with Jeffrey Tarter, Shorts

26 **@LOTUS**

28 **START HERE**
Say It with Pictures
BY DANIEL GASTEIGER

MACROS

34 **1-2-3 MACROS**
Macros Can Speed Up Your Work with *1-2-3* Add-Ins
BY NICK DELONAS

38 **SYMPHONY MACROS**
From Table to Form in a Snap
BY NICK DELONAS

42 **@WORK**
1-2-3 Card File
BY DANIEL GASTEIGER

RESOURCES

81 **THE 1989 *LOTUS* INDEX**

93 **GOOD IDEAS**

96 **Q&A**

REVIEWS

100 *AutoSwap* and *Dr. Switch*
BY BILL LAWRENCE

102 *Quicken* and *Checkwrite Plus*
BY DOUGLAS CHING

106 *Look&Link*
BY TOM CARLTON AND R. MARTIN TEMPLE

108 **ADVERTISER INDEX**

108 **EDITORIAL EVALUATION**

108 **READER SERVICE CARD**

110 **NEW PRODUCTS**
HP LaserJet IIP, IBM LaserPrinter, and more

116 **ESSAY**
Multitasking at Comdex
BY MARK SCAPICCHIO

COVER: GREG RAGLAND

FEATURES

46 **MAKING THE BEST USE OF RESOURCES**
Use this linear programming worksheet to find the most sensible product mix.
BY KEN SAUL

52 **MEET THE MULTIDIMENSIONAL WORKSHEET**
3-D features in *1-2-3* Release 3 help you organize and manage your data more effectively.
BY STEPHEN L. NELSON

57 **TROUBLESHOOTING THE INSTALLATION OF RELEASE 3**
This series of procedures may help you successfully run *1-2-3* Release 3.
BY ERIC MANN

64 **ELEVEN TIME TRIALS**
Concerned about spreadsheet speed? A comparison of *1-2-3* Releases 2.2 and 3 holds a few surprises.
BY DANIEL GASTEIGER

69 **CALCULATE ACCELERATED DEPRECIATION**
This worksheet and documentation take the mystery out of MACRS depreciation.
BY STEPHEN L. NELSON AND ALAN L. GRAY

74 **HOW TO PREDICT SEASONAL PATTERNS**
To see if there really is a trend in your sales, filter out the effects of the yearly cycle.
BY EVERETTE S. GARDNER JR.

74 *Making reliable projections of growth and trends*

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STAFF LETTER

YES, SOMETIMES WE GET OFF BALANCE

Most of you passed the contents page to get here. You may have noticed that this issue has three features dealing with *1-2-3* Release 3. Depending on where you're coming from, that may either please you or annoy you.

Let's start with the up side. There's a lot of new stuff in Release 3. We outlined it pretty well last July. Now that a fair number of you have that release, it's time to dig into some of the details.

Not surprisingly, we focus first on the capabilities that most readily distinguish Release 3 from Release 2.01, namely those that have earned it the "3-D" moniker. This month, Contributing Editor Stephen Nelson provides a basic tutorial (page 52) on how you deal with the multidimensional worksheet. Next month we'll have a similar tutorial on how you deal with the other aspect of 3-D: multiple files in memory.

The other Release 3 tutorial this month has to do with installing the program (page 57). If you have already hurdled that barrier, we're too late to help you, but maybe we can help you help a colleague. It's no accident that this article was written by a member of Lotus Development Corp.'s product-support team. The less time that team has to spend helping people install Release 3, the more time team members can spend helping you take full advantage of its new features—or those of Release 2.2.

The third article in this month's Release 3 package (page 64) fulfills a promise we made last July. At that time, what we knew about the performance—read "speed"—of Release 3 was based on our experience with a late beta, or development, version. We said we'd get back to you after we'd had time to test the production version. In this issue, Contributing Editor Daniel Gasteiger gives the results of 11 comparative tests of Release 3 running against Release 2.2. You can read them for yourself.

Now the down side. We don't know yet how many of you have Release 3 or expect to get it soon, though we're in the midst of a survey that should tell us. We do know that Release 3 users right now are a minority of you, and we don't expect that to change any time soon. So, you might well ask, why so much on Release 3?

The answer, of course, is that what's new—and worthwhile—always has to get the nod over what's old. In fact, the ability to respond month after month to new ideas and new challenges is what makes a magazine potentially so valuable to its readers. It's also fun for the editors.

But we promise that we won't turn the book over to Release 3 or to the other new versions of *1-2-3* that are just around the corner. There's too much yet to learn and teach about *1-2-3* Releases 2.01 and 2.2, not to mention *Symphony* Release 2.0.

For example, I never figured on doing linear programming in a spreadsheet. But in this month's cover feature, author Ken Saul makes me a believer. Best of all, his model is one you can run in those good old releases—2.01 of *1-2-3* (as well as 2.2 and 3) and Release 2.0 of *Symphony*.

So, we may be out of balance now and then. But we'll still be there for you.

John B. Campbell
Editorial Director

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LETTERS

RELEASE 3 LIMITATIONS

I want to thank Lotus Development Corp. for all the graph capabilities in *1-2-3* Release 3. Unfortunately, the spreadsheet side of the program leaves much to be desired. Why won't it support 132 columns? I was shocked to find that no choice for 132 columns exists in the Install menu and that there are no options for using other manufacturers' drivers with the program. Release 2.01 handles 132 columns and other drivers nicely. I didn't buy an 800 by 600 VGA for this 80 by 25 nonsense. Lotus told me it would make a note of my suggestion, since it has no immediate plans to incorporate 132 columns. I ask all users of *1-2-3* Release 3 to call Lotus and tell them that they want more than just an 80-column display.

Brian L. Jones
McInnis Contract Lighting
Chicago, Ill

Editor's note: *We asked Lotus Development Corp. for a response, which follows.*

We recognize your frustration with the lack of a driver for a 132-column display. Release 3 provides a broad range of support for video adapters. With a VGA adapter, for example, you can select a 25-, 34-, or 60-line display.

The development of a 132-column driver, or any other drivers, by the time of the first shipment of Release 3 was precluded by the scope of that product. *1-2-3* Release 3 is the first application to provide support for both DOS and OS/2 in the same package. When this support is coupled with support for networks, as well as for stand-alone PCs, you can see how the development of additional drivers would have increased the testing efforts substantially. It was not feasible to include any more drivers in time for Release 3's ship date.

Because we are committed, however, to supporting the latest hardware technologies, we will provide support for additional drivers in the future.

Alice Meade
Product Design Manager
1-2-3 *Release 3*

CAPITAL LEASE: START OR END?

In "Is That Truly a Capital Lease?" [August], Mr. Nelson is incorrect when he says on page 63, "Test four says that the lease is treated as a capital lease if the present value of the minimum lease payments equals or exceeds 90% of the fair market value of the leased property at the end of the lease...."

Actually, test four says that the lease is treated as a capital lease if the present value at the beginning of the lease term of the minimum lease payments, excluding that portion of the payments representing executory costs to be paid by the lessor but including any profit thereon, equals or exceeds 90% of the fair value of the leased property to the lessor at the *inception* of the lease, not the *end*.

Rodger D. Mitchell, CPA
Terry & Stephenson, P.C.
Pittsburgh, Pa

Author's note: *The capital-lease worksheet model calculates the present value of the minimum lease payments correctly, but thank you for pointing out my erroneous description of that formula. Somewhere in the writing/editing process, the word* end *replaced the word* start. *As you probably saw, however, throughout the rest of the article, the present-value test was described correctly.*

CHARACTER STRINGS IN FORMULAS—CASE SENSITIVE?

I have the following comments and question regarding the worksheet described in the article "Is That Truly a Capital Lease?" [August]:

1. The formulas in cells D38 and B43 refer respectively to yes and Yes. The word *yes* should appear the same.

2. The formulas in cells A36 and D36 do not seem to be coordinated. Cell A36 refers to @ISNA(D36), and cell D36 returns either 0 or 1.

3. Cell D36 returns @NA, but the formula lists either 0 or 1.

4. Should cell A36 be blank in the illustration?

5. The worksheet should have four @UPPER formulas that convert each entry in cells B4, B9, B23, and B24 to uppercase. A formula that tests the entry in one of these cells would refer instead to the cell containing the @UPPER formula.

Richard A. Bauer
National Service Center
St. Louis, Mo

Editor's note: *Here are responses to your comments and question.*

1. The formula in cell B43 is designed to return either Yes or No. We should have given a formula for cell D38 that began with @IF(B43 = "Yes". *When* 1-2-3 *and* Symphony *evaluate the equality of character strings, they do not consider the case of letters unless you selected the ASCII collating sequence when you installed the program.*

2 and 3. At first glance, it would appear that the formula in cell D36 can return only 1 or 0. However, this formula includes a reference to cell B45, which can return NA. When cell B45 returns NA, cell D36 also returns NA, and it is therefore correct for cell A36 to contain the expression @ISNA(D36).

4. In the illustration of the capital-lease worksheet, cell D36 returns NA. Cell A36 begins with @IF(@ISNA(D36),"" *This means that if cell D36 currently returns the value NA, cell A36 will return an empty string. This is why it appears blank in the illustration.*

5. Yes, this would solve the problem. It would be best to be consistent about capitalization in the first place.

@ERR

"*LOTUS* Models on CompuServe" [November]: To download the file-extraction program referred to in column 3, enter *lib11* at the prompt. The correct phone number for CompuServe's subscription information is 800-848-8199. Ask for representative 146.

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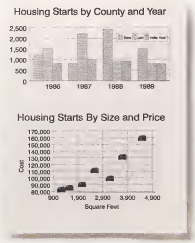

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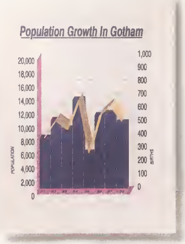

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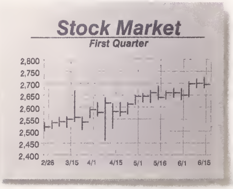

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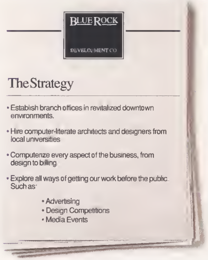

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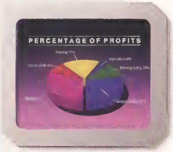

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A FIRST LOOK AT 1-2-3/G, LOTUS'S SPREADSHEET FOR OS/2'S PRESENTATION MANAGER

The G version preserves most of 1-2-3*'s common keyboard commands.*

PAUL WOLF

Although Lotus Development Corp. hasn't formally introduced it, *1-2-3/G* went into beta testing in November and was demonstrated the same month at Comdex, the giant industry trade show in Las Vegas. What follows is an early look at *1-2-3/G*, a spreadsheet program that Lotus built from scratch to run in OS/2's Presentation Manager environment.

When *1-2-3/G* ships in the first quarter of this year, it will battle for market share with *Microsoft Excel*, currently the only spreadsheet available for OS/2-Presentation Manager. However, Workgroup Technologies, a market research firm in Hampton, N.H., estimates that as few as 110,000 packages of *Excel* for OS/2, which shipped in October 1989, were sold by December. So even with *Excel*'s head start, *1-2-3/G* won't be too far behind.

1-2-3/G has an advantage in the huge installed base of *1-2-3*, which owns 62% of today's DOS spreadsheet market—more than three times the 19% share of the DOS-based *Excel* for *Microsoft Windows*, according to Workgroup Technologies. *1-2-3* users who switch to a graphical spreadsheet for OS/2 with Presentation Manager will probably want the full file compatibility that *1-2-3/G* offers. That, plus the fact that most analysts believe that sales of OS/2-Presentation Manager won't gain serious momentum until the end of this year or the beginning of next year, bodes well for *1-2-3/G*.

Lotus hasn't yet announced a price for *1-2-3/G*. But the major cost for those not already equipped will be the required 80286- or 80386-based computer with at least 4 to 6 megabytes of RAM.

The graphical difference

There's no question about it—*1-2-3/G* looks and feels different from the *1-2-3* you use now. Because it was designed for Presentation Manager, *1-2-3/G* offers the pull-down menus, dialog boxes, multiple windows, and WYSIWYG (what-you-see-is-what-you-get) display of a graphical user environment, and you can use a mouse to operate it. Yet Lotus has maintained most of *1-2-3*'s keyboard-based command structure just below the graphic surface. So you can work the way you always have and adjust to the new interface at your own pace.

Release 3 features

While different in form, *1-2-3/G* is similar in function to *1-2-3* Release 3. For example, *1-2-3/G* gives you true three-dimensional worksheets, as well as a file-linking feature that allows you to link data across worksheets and across files. And like Release 3, *1-2-3/G* supports Lotus's DataLens technology for access to external data sources from within the spreadsheet.

1-2-3/G adds a few new twists, however. The treatment of numbers, text, and graphics is greatly extended. And some new goal-seeking features boost the program's what-if capabilities.

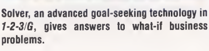
Initially, however, it's the program's graphical appearance that will dazzle users the most. It's as if an old colonial house were torn down to the foundation and rebuilt as a contemporary. There is an openness and freedom in the program that just couldn't exist in the old character-based environment.

The freedom in *1-2-3/G* shows up in the ability to eliminate the worksheet grid, to color the background of cells or ranges, to put borders around worksheet areas, and to use different fonts and point sizes for numbers and text. The number of design choices is abundant, and you will probably have fun discovering new ways to be creative with your worksheets.

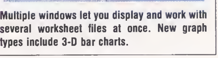
Choosing attributes is simple. You can select colors, fonts, and border styles from nested series of pull-down menus. Then all you have to do is point and click with a mouse. *1-2-3/G*'s Preview mode lets you see how your attributes will look.

You can perform any spreadsheet operation, except entering data, without touching the keyboard. And just as you can use *1-2-3*'s macro language to create custom menu structures, so can you customize *1-2-3/G*. In addition, you can change worksheet elements by physically manipulating them rather than by typing in a command sequence. To widen a column, for example, you can position the mouse pointer, hold down the mouse button, and literally drag one side of the column until its width suits you.

Presentation Manager lends *1-2-3/G* other graphical properties. For example, you can open many windows, each containing one or several worksheets. With the mouse, you can size the windows,



Solver, an advanced goal-seeking technology in *1-2-3/G*, gives answers to what-if business problems.



Multiple windows let you display and work with several worksheet files at once. New graph types include 3-D bar charts.

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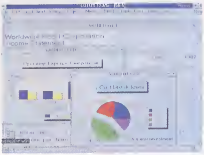
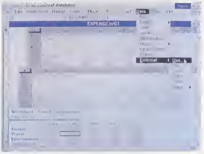


Users can customize graphs and charts.

move them around the screen, and zero in on different worksheet data.

In taking full advantage of the graphical interface, Lotus has not abandoned its existing 7 million *1-2-3* users. "The spreadsheet commands are embedded in their fingertips," says Marty Fahey, general manager for *1-2-3/G*. "We wanted to protect this investment in learning while offering the advantages of the Presentation Manager environment."

Toward that end, all of the most common commands—about 80% of what people do—have been preserved in *1-2-3/G*. You can still retrieve a file by typing */FR* (for File Retrieve), and you can still assign the General format to a range by entering */RFG* (for Range Format General).



***1-2-3/G*'s Data External command provides direct access to external databases via Lotus's DataLens technology.**

As it turns out, maintaining both a graphical and a character-based command structure isn't redundant. You can perform some operations faster from the keyboard, while others would be excruciatingly slow without dialog boxes and a mouse. The most efficient approach is to use the combination of the two techniques that is best for you.

While the graphical interface of *1-2-3/G* changes the spreadsheet's character, other elements push it to a new plateau of functionality. Perhaps the most exciting of these is the optimization capability. There are two types: Backsolver, which handles simple what-if problems, and Solver, which tackles much more complex problems that involve several constraints.

For example, if you know what your sales-to-expense ratio is, Backsolver will tell you what your sales figure has to be to generate, say, $1 million in profit.

Solver, on the other hand, can tell you how to maximize your profit given a mix of conditions. There might be a limit to the number of machine hours available for different product lines, the number of employees you can hire, salary differentials, and the absorption potential of the distribution channel.

Solver responds with several solutions and identifies the optimal one. You can then tweak each variable to reach a more precise answer. "During development, Solver's code name was Colleague because we thought of it as a smart MBA that helps you solve your problems," says Fahey.

A few new twists

In addition to presentation-style graphics, *1-2-3/G* offers beefed-up graphing capabilities. You can create horizontal graphs and three-dimensional or overlapping bar charts, and you can mix chart types. Annotations can appear anywhere on a graph, legends and titles can

THE SPREADSHEET AS A WINDOW INTO CORPORATE DATA

For years corporate spreadsheet users have asked for a seamless and painless way to get mainframe data directly into their spreadsheets. When *1-2-3* Release 3 shipped last June, they got what they wanted. DataLens, a Lotus-developed technology, lets *1-2-3* Release 3 users pull data from a mainframe database, SQL server, or PC database straight into a worksheet.

1-2-3 Release 3's Data External command and the DataLens technology let users retrieve data from external sources without even having to know where it is. And no matter how or where the data is stored, it arrives in the spreadsheet in a consistent format.

Now, *1-2-3/G* gives the spreadsheet a couple of other data-capture tools through the windowing and dynamic data exchange (DDE) facilities in OS/2's Presentation Manager.

"It's a dream come true," says Sheldon Laube, the national director of information and technology for Price Waterhouse, in New York City. Price Waterhouse is an international accounting firm with many autonomous units. Its *1-2-3* users, all of whom have different data needs and analyze problems in different ways, are spread throughout the company and across every managerial level.

Because of the difficulty of getting data from the firm's central database to all the company's spreadsheet users, an analysis was often based on only a fraction of the available data. "But soon, with DataLens, people will be able to get whatever they need when they need it," says Laube.

The spreadsheet makes an ideal tool for analyzing corporate data because its gridlike structure makes immediate sense to financial people. "It is a fundamental metaphor for working with numbers," says David Cearley, senior research analyst at the Gartner Group in Stamford, Conn.

Lotus is working with software vendors to help them write DataLens drivers for their applications. It's also developing some of its own, including one for Borland International's *Paradox*, another for IBM's Extended Edition Database Manager, and a third for the Ashton-Tate/Microsoft *SQL Server*. An Ashton-Tate *dBase* driver is already part of Release 3. According to Marty Fahey, the general manager for *1-2-3/G*, a driver for Novell's NetWareSQL is near completion, and quite a few other drivers are in the works, including one for Microrim's *R:Base*.

However, because *1-2-3/G* fully supports DDE, users will be able to cut and paste data from other applications directly into a worksheet. So even if a DataLens driver doesn't yet exist, data will be directly accessible to the spreadsheet.

DDE also lets users copy data from a worksheet into a word processor or database program. And since applications can run side by side on the screen in Presentation Manager windows, the DDE link between the two programs is easy to use. *—H. F.*

be moved around, and you can add arrows. The data for a graph can be drawn from worksheets in separate files.

In *1-2-3/G* Lotus also introduces "collections"—collective operations performed simultaneously on a group of like elements. For example, you can select and edit multiple ranges or put a border around every subtotal in a large spreadsheet. You no longer have to select and edit each range or subtotal separately.

Other important additions in *1-2-3/G* include the ability to recalculate a worksheet in the background as you continue to work on another worksheet or another program. *1-2-3/G* also has a feature that lets you undo one or more operations. In addition, the program lets you link related worksheets and graphs together so that they're all retrieved at once. Finally, *1-2-3/G* supports OS/2's Dynamic Data Exchange, so you can easily exchange data with other applications (see the box on page 8).

—Henry Fersko-Weiss

Look for a detailed report on 1-2-3/G *in the March issue.*

SORTING OUT GRAPHICAL USER INTERFACES

Microsoft and IBM unite behind OS/2, Presentation Manager.

Under most circumstances, choice is a liberating element in the decision-making process. But in the business of setting standards for the future of personal computing, choice can be a confusing or even a paralyzing factor. The brief history of the graphical user interface (or GUI) for IBM PCs and compatibles has been short on liberation and long on confusion—in part because there are two primary choices: *Microsoft Windows* and OS/2's Presentation Manager.

IBM and Microsoft sought to clarify those choices once and for all in an unusually forthright "statement of direction" that, among other things, reaffirms the commitment of both parties to OS/2. In a joint announcement at the Comdex trade show in November, the two companies agreed to focus the bulk of their development resources on OS/2 products and to make their own graphical applications available, first for the Presentation Manager environment, then for *Win-*

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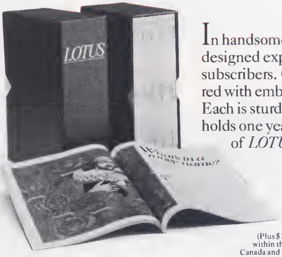

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dows, beginning in the latter half of this year. The two companies also pledged to deliver in 1990 a 32-bit version of OS/2 that fully exploits the power of '386 and '486 microprocessors.

In an attempt to set clearer parameters for business decision makers today, IBM and Microsoft defined the "platform for the 90s" as a '386 or '486 system that has 4 megabytes of memory and runs OS/2 and the Presentation Manager interface. Platforms equipped with 2 megabytes of memory or less should use the *Windows* interface, according to the new guidelines. IBM also quashed rumors of a "light" version of Presentation Manager for DOS, asserting that its only downsizing efforts are aimed at squeezing OS/2 Extended Edition 1.2 into 2 megabytes of memory.

A meeting of minds

Just as significant as the content of the announcement, perhaps, was the fact that IBM and Microsoft—which frequently seemed at odds over the roles that *Windows* and Presentation Manager should play in the emergence of the GUI—apparently were now working together more closely.

"We're announcing a renewed relationship," said James Cannavino, president of IBM's Entry Systems Division. "Folks depended on us for direction. We had to get things straightened out."

The announcement's spotlight on OS/2 and the positioning of *Windows* as an "entry graphical workstation" heartened software developers who had chosen to focus on Presentation Manager applications, only to see an increasingly successful *Windows* market overshadow (and possibly pilfer) early OS/2 sales. Lotus Development Corp., with *1-2-3/G*, a newly announced version of *1-2-3* for Presentation Manager, but no similar product for *Windows*, was among the publishers who viewed the public statement as a vindication of sorts.

"*Windows* had its wings clipped," said Lotus President Jim Manzi, following the IBM-Microsoft announcement.

Windows developers and supporters see it differently. IBM, they contend, publicly endorsed *Windows* for the first time and ceded most of the current GUI market to Microsoft rather than pursue its own graphical interface for DOS. *Windows* might not be the platform for the future, they say, but it is now officially the platform of the present.

PAUL WOLF

"*Windows* didn't get its wings clipped at all," insists Paul Grayson, chairman of Micrografx, a leading developer of *Windows* applications. "On the contrary, this announcement clearly positions *Windows* as the graphical user interface for the majority of the machines out there today."

THE MESSAGE
FROM IBM
AND MICROSOFT:
'A RENEWED
RELATIONSHIP'

Indeed, the number of PCs today with insufficient speed or memory to run OS/2 effectively dwarfs the number of those that have such resources. Many of these less powerful systems can run *Windows*, though. That fact, coupled with the relative dearth of Presentation Manager applications, makes *Windows* the only viable GUI for many people. Sales of the two GUIs reflect as much. Fewer than 100,000 copies of OS/2 Presentation Manager were installed by the end of 1989, according to International Data Corp. (IDC), a market research firm in Framingham, Mass., versus more than 3 million copies of *Windows*.

The other players

There are also other GUIs available for DOS. The *GEM* environment from Digital Research (Monterey, Calif.) plays host to *Xerox Ventura Publisher*, as well as to several lesser-known applications. And Hewlett-Packard's *NewWave* extension to *Windows* has, in recent months, garnered some support among an influential group of *Windows* developers, including Microsoft, Samna, and Micrografx. These developers are promising *NewWave* versions of their products that can be tightly integrated with each other. But neither *GEM* nor *NewWave* is expected to challenge *Windows* seriously as the dominant GUI. In the short term, even Presentation Manager may not rival *Windows*.

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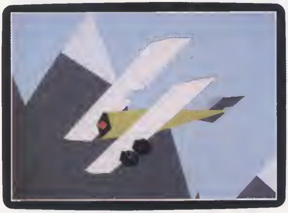

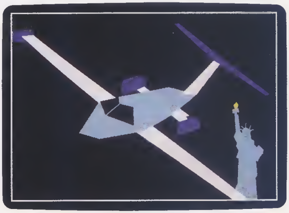

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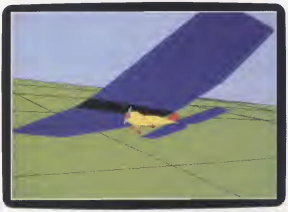

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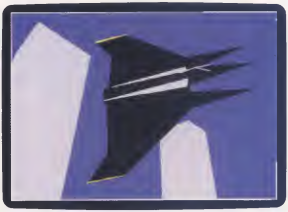

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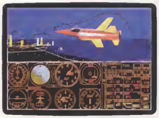

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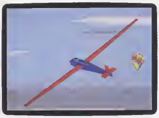

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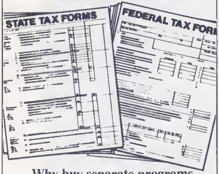

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doesn't work," says Carole Patton, publisher of *Acknowledge*, a Mendham, N.J., monthly newsletter for *Windows* and Presentation Manager users and developers. "The reality is that while the [OS/2] technology is terrific, most users don't need it or can't use it right now. OS/2 will come, but not as soon as IBM would like."

WINDOWS NEED NOT FADE AWAY FOR OS/2 TO PROSPER.

Patton and others argue that IBM and publishers who chose to ignore the *Windows* market are attempting to rush OS/2 and Presentation Manager to justify their development efforts. But the corporate marketplace's warm response to a maturing body of *Windows* applications and its cool, cautious response to early Presentation Manager offerings is an indication, say some, that customers refuse to be stampeded into using OS/2.

"All the technical arguments in the world don't mean a thing to customers," claims Basil Maloney, executive director of the Windows & Presentation Manager Association (Richardson, Tex.), an alliance of software publishers that promotes development for both GUIs. "Customers want solutions, and *Windows* can offer them that now," he says. "OS/2 and Presentation Manager aren't there yet, and people are tired of waiting."

A shift of focus

Even so, many observers believe the IBM-Microsoft announcement marks a turning point for OS/2 and Presentation Manager by shifting attention away from the present attractions of *Windows* to the future lures of OS/2, including its superior support for multitasking, for network-server applications, and for IBM's Systems Application Architecture (SAA) scheme for connecting different computing platforms.

"I think [the announcement] takes a lot of air out of the *Windows* balloon," says Nancy McSharry, a software analyst with IDC. "Some people regard it as a tacit endorsement of *Windows*," she says, "...but the significant endorsement was the reaffirmed commitment to OS/2 and the Presentation Manager environment."

McSharry believes that IBM's displeasure with the slow pace of OS/2 acceptance among both developers and customers prompted the announcement. "The long-term plan was for the two companies to push OS/2, and IBM felt it was time to put on a unified front," she notes. "There's no question that *Windows* has been cannibalizing OS/2 products and momentum...and Microsoft makes money either way."

The word on the street, says McSharry, is that the forthcoming version of *Windows*, popularly known as *Windows* 3.0, won't include all of the features it would have had before the IBM-Microsoft announcement—a charge that Microsoft flatly denies. The differences between the *Windows* and Presentation Manager environments, insists Microsoft, will be attributable to the disparate platforms they run on, not contrived variations for the purpose of manipulating customer choices.

"The key thing [to remember] is that *Windows* is built on DOS," Microsoft chairman Bill Gates said at the announcement. "If they think *Windows* is dead," he reportedly told one developer, "wait until they see the new version."

Windows won't fade away

In fact, Microsoft says it has long viewed *Windows* and Presentation Manager as complementary, rather than competing, GUIs. "We see *Windows* spurring Presentation Manager's success," says Rich Abel, group product manager for *Windows* at Microsoft. "There is acceptance now of the GUI concept because of *Windows*," he explains, "and that's a significant development for OS/2 and Presentation Manager."

Windows, says Abel, need not fade away for OS/2 to prosper. "We really think of *Windows* as completing DOS, and we expect DOS to be around for a long while yet," notes Abel. "Everything seems to last a lot longer than people anticipate in this business."

Nonetheless, both IBM and Microsoft expect most new development will now be for Presentation Manager, as do many of those who already have *Windows* products on the market. "I think anybody who hasn't started *Windows* applications will probably skip *Windows* and go straight to Presentation Manager," says Micrografx's Grayson. "But people with *Windows* projects in the works will defi-

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nitely be moving ahead with them."

Lotus, for one, says it is still studying the *Windows* market and has not committed to a *Windows* version of *1-2-3* or any other of its products. Similarly, Software Publishing Corp. and several other major software publishers are publicly undecided at this writing. WordPerfect Corp., on the other hand, has said it plans to deliver the Presentation Manager version of its namesake word processor by midsummer. The *Windows* version will follow shortly thereafter.

"I hope memory is cheap enough that everybody goes right to OS/2 and Presentation Manager and can skip *Windows*, but I'm not confident that is going to happen very quickly," says W. E. "Pete" Peterson, executive vice president at WordPerfect. "*Windows* is only an interim solution, but I think *Windows* 3.0 will be a neat product."

Microsoft has the advantage

Interim or not, some developers and would-be developers complain that Microsoft has an unfair advantage in the *Windows* marketplace because it supplies both the graphical interface and the applications for it. Microsoft says its systems and applications divisions work separately, and that it goes out of its way to encourage software developers to create products for *Windows*. But even successful *Windows* developers can empathize with the complaint.

"If there's a church and state at Microsoft, then Bill Gates is both pope and king," says Paul Grayson. "He moves freely from applications to system development and uses it to his competitive advantage."

'WINDOWS HAD ITS WINGS CLIPPED,' SAYS MANZI.

Still, Grayson and others already in the *Windows* market say that many developers who didn't anticipate *Windows*' success now take the easy way out and blame Microsoft instead of themselves. "We're a direct competitor to Microsoft, but we've got nothing but good things to say about their systems-development

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people and the kind of cooperation we've received," reports Bruce Cummings, executive vice president of Samna Corp., which publishes *Ami* and *Ami Professional*. "You have to keep screaming," he says. "When we raise hell, we get action."

No matter how the *Windows* market fares over the next few years, there is little doubt that the IBM-Microsoft announcement and the introduction of major applications, such as *1-2-3/G* and *WordPerfect*, will help propel Presentation Manager into the mainstream.

"The things that Presentation Manager applications do are the things that people want," notes Marty Fahey, Lotus's general manager for *1-2-3/G*. "The applications might not be big sellers at first, but when *1-2-3* is on a platform, it helps push the platform."

Ultimately, applications are all that matter. "It's not a *Windows* or a Presentation Manager market, it's an applications market," says Micrografx's Grayson. "We're spending too much time arguing about operating systems and graphical user interfaces, when users are really looking for application solutions."

—Christopher O'Malley

PRODUCTS AND POLITICS AT COMDEX/FALL '89

New alliances, new players, and new standards

No dividing wall crumbled nor government fell, but political drama was high in Las Vegas at November's Comdex/Fall '89. While a record number of showgoers trod the 21 miles of aisles, software and hardware developers staked new territorial claims and forged overlapping alliances.

For the mainstream business user, the unveiling of a year-old agreement between Lotus Development Corp. and WordPerfect Corp. may have the most immediate impact. According to top executives from both firms, Lotus and WordPerfect will share interface code for *1-2-3/G*, the OS/2 Presentation Manager version of *1-2-3*, and *WordPerfect* for Presentation Manager.

The code, developed mostly by Lotus, will include such key features as cascading menus and shrinking dialog boxes. And while the display is not exactly what-you-see-is-what-you-get, a preview mode will at least let you see-it-before-you-print-it. A jointly developed extension of the underlying Dynamic Data Exchange (DDE) facility in Presentation Manager will let the products work closely together and share data easily. The programs' functionality and main code will be different, said W. E. "Pete" Peterson, WordPerfect's executive vice president, "but the two products will look as if they came from one company."

1-2-3/G is scheduled for release in the first quarter; *WordPerfect* for Presentation Manager should be available by midsummer. The agreement, both companies admitted, might limit the future of Lotus's *Manuscript* word processor and WordPerfect's *PlanPerfect* spreadsheet. For more on the Lotus-WordPerfect announcement, see @Lotus, page 26. For more on *1-2-3/G*, see "A First Look at *1-2-3/G*, Lotus's Spreadsheet for OS/2 Presentation Manager" on page 6.

A Microsoft and IBM detente

The significance of the Lotus-WordPerfect agreement was heightened by a joint Microsoft-IBM announcement. Speaking at a packed press conference, IBM Vice President James A. Cannavino and Microsoft Chairman Bill Gates announced that after mid-1990, Microsoft will ship each new OS/2 application either before or simultaneously with its *Microsoft Windows* counterpart, if there is one. That is, new products and features will show up first for OS/2 Presentation Manager and may then be retrofitted for *Windows*. Furthermore, IBM intends to make its Extended Edition enhancements to OS/2 available to all Standard Edition users and developers. For more on the Microsoft-IBM announcement, see "Sorting Out Graphical User Interfaces" on page 9.

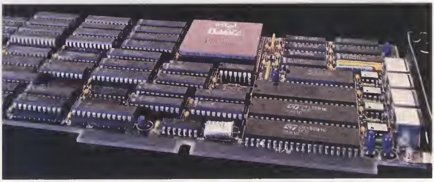
As Microsoft cut back on future *Windows* development plans, Intel pressed its campaign to kill off its own successful 80286 chip in favor of the 80386. Intel's goal is widely ascribed to the company's position as the sole source of the '386 chip. The '286 chip, on the other hand, is made under license by several competing firms.

Intel's chip-switch effort may be tougher than you'd think. According to Michael Slater, editor and publisher of *Microprocessor Report*, a Palo Alto, Calif., newsletter, despite Intel's efforts to undermine the '286 chip, customers continue to order record numbers of them.

Nonetheless, the IBM-Microsoft position may help Intel's effort by strengthening the view that an 80386 or i486 machine with several megabytes of memory and at least a VGA display should be considered the basic business-computing platform for the early 1990s. IBM's Senior Vice President George H. Conrades described the "platform for the '90s" as a '386- or '486-based machine with 4 megabytes of RAM and at least a 60-megabyte hard drive running OS/2 Presentation Manager.

The multimedia message

IBM also strengthened its position in the burgeoning field of multimedia, in what IBM spokesman Peter Blakeney admitted was a deliberate attempt to lay claim to territory that has popularly been ceded to Apple Computer. IBM used the keynote speech by George Conrades and a large part of its giant booth to emphasize that the firm has current products and a serious commitment to future product efforts in multimedia. Using stereo sound, a touchscreen, and full-motion video, Conrades delivered the message that technology is worthless unless it relates to real user needs.



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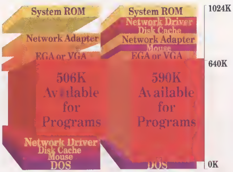

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Meanwhile, Intel supported its own claims of multimedia technology with DVI (Digital Video Interactive) technology. Intel featured its recently announced RTV (Real Time Video) version 1.5, a combination of custom chips and software that enables a PS/2 computer to digitize and compress video images in real time. DVI can produce a CD-ROM (compact disk, read-only memory) consisting of 72 minutes of full-color, full-motion video of sufficient quality for training or industrial use. Intel DVI chief Robert Brannon promised that continued development of the technology would make it widely affordable within the next few years. By 1993, he said, such a system would be available for less than $1,000.

Plans for the i486 move ahead

On the i486 front, Intel flatly denied having problems with the chip, and bug reports don't seem to have scared off manufacturers. Compaq Computer Corp. demonstrated the Deskpro 486/25, a 25-MHz '486 microprocessor that has been FCC-approved but is not yet available. Corollary Inc. (Irvine, Calif.) showed a system that can be configured with 10 of the new processors, and President George White said he has sold OEM versions of his product to Mitac International Corp. of Taiwan and to Zenith Data Systems (which may be owned by France's Groupe Bull by the time you read this). He talked freely about the bug reports: "It's overblown. With the newest revised chip, we're seeing virtually no problems."

Atari's tiny portfolio PC displays 40 characters by 8 lines.

Intel may be taking a stand on chips, but it was among the many industry suppliers who refused to take sides on the question of which bus the new high-performance chips should support—IBM's Micro Channel Architecture or the Extended Industry Standard Architecture of Compaq and other vendors. But then, many observers say that the issue of MCA versus EISA is now moot. As Jan Lewis, president of Lewis Research Corp. (Sunnyvale, Calif.), summed it up, "It is possible that both EISA and MCA will succeed."

IBM's Conrades declared the bus wars over, and IBM and Compaq have now cross-licensed their bus designs. Machines based on both technologies were scattered around the floor. Unofficial counts gave EISA the majority of booths but gave MCA the lead in current shipments and number of add-ons.

Laptop compromises

Perhaps, too, the lack of fire in the EISA-versus-MCA controversy can be attributed to the large number of introductions of portable machines without any standard buses at all. From hand-held com-

Compaq's LTE and LTE/286 weigh 6 pounds and feature a 3½-inch floppy drive.

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puters to laptops with color flat-panel display screens, more than 50 portable computers graced the halls and aisles.

Among the apparent hits were the $400 Atari Portfolio, designed in England, and the Poqet PC, a $1,995 handheld unit from Poqet Computer, a Sunnyvale, Calif., company that is 38% owned by Fujitsu. Both weighed about a pound but got there with compromises like credit card–size RAM and ROM cards instead of disk drives, and keyboards only a Lilliputian could love. However, the Poqet made up for its undersize keyboard with a two-month battery life. Like the Poqet and Portfolio, the 4-pound Psion models MC-200, MC-400, and MC-600, from England's Psion Ltd., also traded disk drives for plug-in memory cards and backlighting for longer battery life.

The GridPad, from Grid Systems, converts your handwriting to typed characters.

The no-compromise laptops weighed 6 pounds. The Compaq LTE, with many parts made by Citizen Watch Co. of Japan, was typical. It has a 20-megabyte hard disk and a 3½-inch disk drive, as well as a backlit screen and a desktop-quality keyboard. A similar machine, the MinisPort from Zenith Data Systems, drew poor reviews for its nonstandard 2-inch disk drive.

Tandy's Grid Systems (Fremont, Calif.) showed the GridPad, the first portable to recognize handwriting. Using a pen-like marker, you can fill in a form on the GridPad screen, which converts your handwriting to typed characters.

The Russians are coming

As well as *perestroika* in the laptop market, Comdex was a showcase for software *glasnost*. Partnerships and cross-licensing are in, lawsuits are out. Software Products International (San Diego, Calif.) announced a joint venture with the Soviet Academy of Sciences to market officially translated versions of PC software programs in the Soviet Union, starting with SPI's *Open Access II* and *Open Access II Network*. As part of the new venture, dubbed Intersoft, SPI will market English versions of Russian software in this country.

Another Soviet firm, GlasnostSoft (with a U.S. office in San Francisco), demonstrated a business word processor called *PolyText*. "It's true that my software may not be as powerful as some of the American programs," said Arkady Borkovsky, "but it unifies file functions, as well as text information, and it supports 31 simultaneous resizable windows."

Not only the Russians, but the Indians are coming. Comdex is a grand display of silicon wealth, but U.S. companies harbor a fear of cheap-labor products that will turn their advantages back into sand. This year it's the software writers' turn to worry, as India staked its claim in the software market. One Indian entrepreneur, the owner of a Calcutta company called Zoom 16, claimed he could write a custom program for 1/13 of what American companies charge.

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and backing up your files—foreign or otherwise—more than half a dozen firms showed 1.2-gigabyte tape storage units that are based on digital audio tape (DAT) and 8-millimeter video-recording technology. Just about every medium showed new highs in capacity, from the 20-megabyte 3½-inch floppy disks from Brier Technology and Insite Peripherals, both of San Jose, Calif., to a 1-inch paper-tape write-once system that stores 1.2 gigabytes (1,200 megabytes), shown by ICI Imagedata (Wilmington, Del.).

Qualified bulletin board operators can get Hayes' Ultra Smartmodem 9600 at half price.

Backing up your files should be easier with a new Peter Norton Computing (Santa Monica, Calif.) program called *The Norton Backup*, which claims to protect against data loss by making backups against hard-disk failure, virus damage, or user "accident." Norton said it automatically configures itself to its environment and offers four levels of data compression and three levels of data verification. Norton added it will even recover data from damaged backup disks, and it will work automatically on single

SOFTWARE IN 1990: WHAT'S HOT AND WHAT'S NOT

Industry analyst Jeffrey Tarter gazes into his crystal ball.

Predicting the future is always a dicey business, and it is particularly risky in the volatile and fast-changing software industry. Nonetheless, we asked Jeffrey Tarter, a respected industry analyst and publisher of *SoftLetter*, a newsletter based in Watertown, Mass., for his best guess on what will be in and what will be out as we begin the new decade. In a late-October interview with *LOTUS* contributor Jon Pepper, Tarter addressed subjects ranging from *1-2-3* Release 3's prospects to the confusion about different graphical environments for the PC.

LOTUS: Do you think Release 3 will become the corporate spreadsheet standard over the next year?

Tarter: Sales of Releases 2.01, 2.2, and 3 are divided pretty evenly right now. Eventually, I think Release 2.01 will drop out and Releases 2.2 and 3 will more or less split the lion's share of the DOS spreadsheet market.

It is a slow process because a lot of Lotus's key accounts aren't just making an individual purchasing decision—they're considering a corporate standard, which takes time. But I think that most of that evaluation process will be completed in 1990.

LOTUS: And you think Release 2.2 will continue as a strong, independent product?

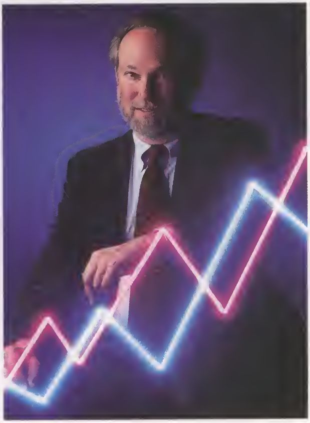
Tarter: Yes. Release 2.2 is clearly designed for a different segment of the corporate market than Release 3. Release 2.2 is graphically stronger than Release 2.01, particularly with the *Allways* add-in, and it runs on less-powerful machines than Release 3, as well as being a little faster.

LOTUS: Do you think the delay in bringing out Release 3 opened the door for other new graphical spreadsheets, such as *Quattro Pro* and *Microsoft Excel*?

Tarter: Lotus has not lost significant market share in the past year, and I don't see any reason to think it will lose significant share over the next year—even without a full WYSIWYG [what-you-see-is-what-you-get] product. Most of the market share for *Quattro* and *Excel* seems to be at the expense of other second-tier spreadsheet products, such as *SuperCalc*, *VP-Planner*, and *MultiPlan*, which have all declined in sales.

LOTUS: What about the graphical user interface [GUI]—will it become a major factor in the spreadsheet market soon?

Tarter: The GUI issue is a lot more complicated. First, graphics is traditionally one of the areas where Lotus has been slow to react. It's fascinating that a company that pioneered a tight link between graphs and worksheets in the original *1-2-3* had to go out and acquire a graphing product [*Freelance*]. Ditto for the spreadsheet-enhancement features of *Allways*. So it's probably safe to say that Lotus will continue



LOU JONES

machines, networks, or any other DOS device, all for $149.

In the modem market, peace is at hand over standards while the war has begun over prices. All major vendors offered 9,600-bps dial-up modems following CCITT standards called V.32, V.42, and V.42bis, giving them an effective speed of 38,400 bits per second, using compression. The price starts high, at $1,199 for the Hayes V-series Ultra Smartmodem 9600 and $1,045 for Universal Data Systems' FasTalk V.32/42. But there's good news, as well: U.S. Robotics cut its modem prices 27%, and Hayes offers its Ultra Smartmodem 9600 to qualified bulletin board operators at $599.

Universal Data Systems' FasTalk V.32/42 modem complies with new CCITT standards.

Fax machines and more

Fax modems and fax machines are also on the rise. Many of the major Japanese printer makers added fax machines to their booths this year, with most of them promising fax-to-PC links by Comdex/ Spring '90. One clever solution is the JetFax from Hybrid Fax (Menlo Park, Calif.),

to bring up the rear in the graphical spreadsheet market.

LOTUS: How much of a problem will that be for Lotus?

Tarter: At the moment, the demand for graphical spreadsheets is from a relatively narrow group of users. The problem is that Lotus seems to be waiting for the demand to swell, but it won't be that evolutionary a change. The switch will happen very fast when it happens, and Lotus has very little to offer there now. The transition to graphical environments is one of *the* big issues that will change computing, and it is interesting that Lotus, which has been very sensitive to the cross-platform issue and has put a lot of resources and vision into it, should view graphics as a lower-priority issue.

LOTUS: So is 1990 the year when graphical environments become a real force?

Tarter: Probably not. In fact, I think we may see a period of "graphical paralysis" in 1990. The problem is that a GUI standard is a myth. At this point, applications developers are facing two versions of *Microsoft Windows*, one of which—*Windows* 3.0—isn't even official yet. And IBM is still trying to reduce the memory requirements of OS/2 Presentation Manager. And there are other graphical environments, like *GEM*.

The PC environment is really getting crazy. There's a lot of confusion out there. I think developers and users will sit this one out until something definitive happens.

LOTUS: What's happening with the personal information managers [PIMs]—like *Lotus Agenda*—that were supposed to be the next big software trend?

Tarter: I must admit that I was one of those who got excited about them two years ago, and I blew it. I think that category is effectively dead. The PIM people keep saying it's just a matter of public education before the market takes off, but the fact is, this is no longer a tenable position. There have been more than enough ads and discussion in the computer media about PIMs, and they still aren't selling.

I think the real market for information management is in two areas: dedicated contact-management programs like *ACT!* [from Contact Software, Irving, Tex.], and programs that manage really huge text databases. So maybe the PIM category will evolve into a text-database-retrieval category, which is where Persoft [Madison, Wisc.] originally positioned its *Ize* program.

LOTUS: Will we see some good CD-ROM [compact disk, read-only memory] software this year?

Tarter: I find a striking lack of creativity in the CD-ROM market. Too many CD-ROM publishers are just taking existing text and putting it on a compact disk without rethinking the concept. For example, Microsoft put together about 11 programming references on a CD-ROM and didn't even bother to combine the indexes.

The whole situation is like what happened in Gutenberg's time. The first product of Johannes Gutenberg's 15th-century invention—movable type—was a clone of a handwritten Bible, but it took people 70 more years to figure out they could do more than just automate the work of monks. What we need for CD-ROM is a few more years for people to start thinking of new ways to use the medium. That's the hard part—the technology is the simple part.

LOTUS: What other software trends can we look for in 1990?

Tarter: Forms processors are emerging as a very solid application category. We live in a world that is overwhelmed with forms. Some offices are so forms-intensive that it's almost irrelevant for them to automate anything else. Many products, including databases, spreadsheets, and accounting packages, can generate some level of forms, but they all deal with pieces of the problem. We're just starting to see some really good forms programs that let you both draw the form and manage the data in a useful way.

Another thing to look for is more movement of workstation-based software into the PC arena. The workstation-software companies are the ones with the best handle on OS/2, since they know what integrated workstation software should look like. Also, because they aren't handicapped by having to protect their existing market, they will be the ones who start doing the really interesting things. I don't think you will see a lot of innovation on the OS/2 platform from the Lotuses or Microsofts or WordPerfects. ■

which plugs into a Hewlett-Packard or compatible laser printer and lets any PC user connected to the printer receive laser-printed faxes. Accompanying software lets you create phone directories, perform mail-merge functions, and broadcast a fax to a mailing list.

Another solution is SmarterFax, from Electronic Modules (Dallas). One model simply lets a fax machine share a phone line with a telephone and a modem. But a memory-expanded version lets you deliver faxes to mailing lists, maintain confidential mailboxes, and retrieve the contents of your mailbox from any remote location.

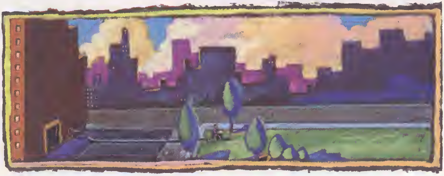
Nissei Electric U.S.A., a Japanese firm that makes its U.S. home in Closter, N.J., introduced new products called SF 100 and Letterfax. The former retails for $1,495 and combines the functions of a scanner and a fax machine. The latter, $1,195, weighs just 7½ pounds and can be used as both a printer and a fax machine by any laptop computer.

In hard-copy output, low-cost laser printers, led by the Hewlett-Packard LaserJet IIP, attracted steady interest. But despite predictions that low-cost lasers would lead to the demise of the dot-matrix, many printer makers were featuring new dot-matrix models. Full-color printers using ink-jet and dye-transfer methods were also in good supply, with prices for color PostScript models finally breaking the $10,000 level.

For boosting the speed of your laser printer, Eicon Technology Corp. of Montreal announced a new PostScript-compatible controller using Intel's recently introduced i960 chip. Marc Jetté, Eicon's vice president of image systems, said the new EiconScript controller card can pass a page from PC to printer in just 15 to 20 seconds. And that speed will be increased greatly next year, he added, through software optimization.

However, not every trend was marked by rising performance or a flourishing diversity of products. The influence of Unix on the business desktop computer, for example, was more conspicuous by its absence than by its presence, as were artificial intelligence products. Despite a strong effort by key Unix distributor The Santa Cruz Operation to put Unix on '386 and '486 systems, a map of Comdex made by that firm showing where to find such systems showed relatively few islands of color.

—Dana Blankenhorn/Steve Rosenthal



PAUL WOLF

NETWORK LINKS FOR LAPTOP COMPUTERS

A little hardware ties your portable into the company net.

What do you get when the separate trends toward portable PCs and work-group computing converge? You get a bunch of networking products that let you plug your little computer into the big picture.

"People want the portability of a laptop, but they also want to be a part of the network once they get where they're going," says Steve Magidson, vice president of marketing at Xircom (Woodland Hills, Calif.), a one-year-old company that is targeting the connectivity market for portable PCs. "With the push on in both laptops and connectivity," he says, "the time seems right to combine the two."

About 850,000 IBM-compatible laptop computers will be sold in the United States this year, and 1990 sales will exceed a million, according to International Data Corp., a market research firm in Framingham, Mass. The prospect of even a sliver of this $2 billion-plus pie is likely to inspire a throng of local area network (LAN) products designed for laptop computers.

Laptop maker Toshiba, as well as several independent companies, including Megahertz Corp. (Salt Lake City) and PureData (Carrollton, Tex.), now offer laptop connectors for Ethernet LANs. And adapters for other laptop models and network architectures are forthcoming, say manufacturers.

Circuit boards and other devices

Most laptop adapters are circuit boards that plug into a portable computer's expansion or modem slot. They generally cost between $495 and $595 and typically require an external AC adapter for battery-operated laptops.

Xircom offers an alternative to the internal circuit board. Its Pocket Ethernet Adapter ($695) is an external device about the size of a cigarette pack. Because it plugs into a laptop's standard parallel port, it works with virtually all laptops. The Xircom device uses a separate AC adapter and comes in versions for both thick-cable Ethernet and thin-cable "cheapernet" LANs. The company expects to deliver similar models for Token-Ring and Arcnet network architectures in the first quarter of 1990.

Slower communications

Once you've installed a LAN adapter and software driver, you simply connect the network cabling to your laptop and log onto the LAN as usual. Communications will be slightly slower than normal if you're going through the printer port, but otherwise it works the same as a desktop link, making it easy to share *1-2-3* worksheets and other data with coworkers.

PEOPLE WANT LAPTOP PORTABILITY PLUS THE ADVANTAGES OF A NETWORK.

All of the Ethernet adapters currently available include software drivers for Novell's NetWare network operating system. A few, such as Megahertz's LapLAN card ($499), also support other network operating systems, including IBM's OS/2 LAN Server, Banyan Systems' Banyan Vines, 3Com's 3+, and Digital Equipment Corp.'s DECnet. Xircom says it now supports the 3Com and Novell networks and plans to support the others, as well.

—Christopher O'Malley

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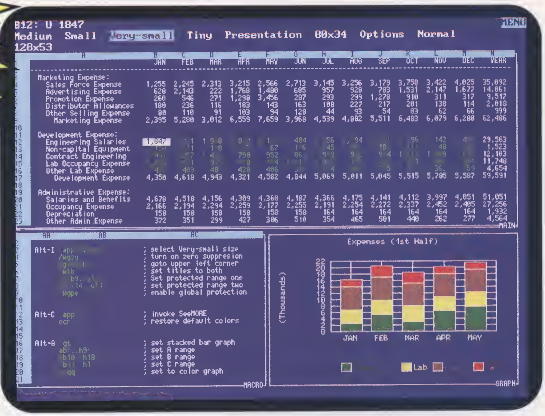

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   Advertising Expense        628  2,143    222  1,768  1,480    685    957    928    783  1,531  2,147  1,677  14,861
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   Distributor Allowances     180    236    116    183    143    163    108    227    217    201    138    114   2,018
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 Development Expense:
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   Contract Engineering     [illegible]                 790    952     86                                         12,103
   Lab Occupancy Expense    [illegible]                                                                          11,748
   Other Lab Expense        [illegible]   409     48    428    406                                                4,654
     Development Expense    4,350  4,618  4,943  4,321  4,582  4,844  5,069  5,011  5,045  5,515  5,785  5,587  59,591

 Administrative Expense:
   Salaries and Benefits    4,678  4,518  4,156  4,309  4,368  4,187  4,366  4,175  4,141  4,112  3,997  4,051  51,051
   Occupancy Expense        2,166  2,194  2,294  2,259  2,177  2,255  2,191  2,254  2,272  2,337  2,452  2,405  27,256
   Depreciation               158    158    158    158    158    158    164    164    164    164    164    164   1,932
   Other Admin Expense        372    351    299    427    306    510    354    465    501    440    262    277   4,564
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        /wgzy               ; turn on zero suppresion
        g                   ; goto upper left corner
        wtb                 ; set titles to both
          b9.               ; Set protected range one
          ..14              ; set protected range two
        wgpe                ; enable global protection

 Alt-C  app                 ; invoke SeeMORE
        ocr                 ; restore default colors

 Alt-8  gt                  ; set stacked bar graph
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Instant Screen Compression.

Like it's predecessor, SeeMORE Version 2 lets you zoom in or out with the push of a key. You get a choice of compressed fonts that double, triple or quadruple the number of cells displayed.

SeeMORE lets you build a 12 month forecast without stopping to scroll left and right. All 12 months appear on the screen. With more of your worksheet in view, trends and relationships become clear. SeeMORE lets you see the big picture.

Multiple Windows.

SeeMORE Version 2 provides a complete windowing system for 1-2-3. Create as many tiled or overlapping windows as you like including multiple graph windows!

Change the size and position of any window with ease. A special feature called "restrict ranges" lets you limit the effect of insert and delete operations to individual windows.

Live Action.

All windows remain active as you enter and edit data. Build a macro in one window while monitoring its operation in another. Change cell values and watch graphs update automatically. Bring "what-if" analysis alive.

No Special Hardware Required.

SeeMORE works with 1-2-3 Release 2, 2.01 and 2.2 and Symphony 1.1, 1.2, and 2 on any PC equipped with a standard graphics adapter. (CGA, EGA, VGA, MCGA, Hercules, 3270PC, AT&T 6300, or Compaq/Toshiba gas plasma.) Join noted columnist Jim Seymour who says, "I use SeeMORE almost constantly."

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CIRCLE 101 ON READER SERVICE CARD

If you own an earlier version of SeeMORE you can upgrade for $25. Send your original SeeMORE program disk to Personics along with your check and shipping instructions.

REDEFINING REALITY

For years science-fiction writers have been predicting computer simulations so good that they would be virtually indistinguishable from reality.

So-called virtual-reality technology is designed to give people the impression that they are actually inside of a computer simulation, instead of observing it. Autodesk (Sausalito, Calif.), best known for its popular computer-aided-design package, *AutoCAD*, appears to be the leader in the virtual-reality race. But other manufacturers are sure to follow, say analysts.

No company has yet announced a virtual-reality product, but Autodesk is working on a project called Cyberspace. The Cyberspace toolkit combines a head-mounted display with a glovelike input device. The headset, called EyePhone, consists of a pair of wide-angle lenses that you look through into two small LCDs. These two lenses create a three-dimensional effect, and sensors detect head motions so that your view of the image shifts as you move your head.

You can change the image with, literally, a wave of your hand. Embedded flexion sensors in the input device, called DataGlove, translate hand and finger movements into electrical signals and transmit them to the display.

By combining the headset, the glove, and a sophisticated graphics board, a user can work with computer-generated graphic images that simulate the inside of a building, a forest, or any other scene. "Cyberspace," says the company, "makes CAD drawings come alive."

—Jon Pepper

Autodesk's EyePhone headset and DataGlove input device create a computer environment that simulates reality.

BOOKS: SPIES AND MORE

Two books about computers are starting to attract wide readership and inch their way up the best-seller charts. These aren't your typical how-to computer manuals, lightly disguised as books. Instead, *Microcosm: The Quantum Revolution in Economics and Technology*, by George Gilder (Simon & Schuster, 426 pages, $19.95), is an important primer on new high-tech developments and on how the United States stacks up competitively against Japan. (Very well, according to Gilder.) *The Cuckoo's Egg*, by Clifford Stoll (Doubleday, 326 pages, $19.95), chronicles the unmasking and arrest of a West German spy ring that had been stealing information from U.S. computer networks and selling it to the Soviets.

Stoll recounts, in fascinating detail, how he came up with an ingenious plan to track the hacker-spy's every keystroke. By the time the spy was caught, he had led Stoll and a half-dozen national agencies on a year-long chase through computer networks that joined military and industrial computers around the world.

Gilder's book takes a broad look at the future of technology. He focuses on some of the colorful, oddball characters that have single-handedly advanced the state of the art. Not only do we learn about the people and ideas behind new technologies, but we get an international perspective on each development.

—Rich Friedman

FAX PUBLISHING

With more than three million fax machines operating in the United States, faxes have become an integral part of business. Several companies are finding innovative ways to expand their use.

Copia International (Wheaton, Ill., 312-682-8898) sells software that helps businesses become fax publishers. Copia's *FaxFacts* program runs on an IBM PC AT or a compatible PC equipped with an audio board and a fax board. The software controls a network-based database that you create to store sales literature, specification sheets, or any other information you care to make available.

Your customers can then dial into the system from a fax telephone and—guided by the system's voice component—request any document stored in the database. The system delivers the requested document instantly to the caller's fax machine and logs the details of each transaction into a *dBase* file. The first-year license fee for *FaxFacts,* including upgrades and unlimited support, is $2,000 for the first four phone lines.

In a more classic publishing vein, Pinpoint Information Corp. (Chantilly, Va., 800-767-3636) puts together a daily newsletter called *Computer Focus* and delivers it to your fax machine overnight.

A subscription price of $1,800 a year may seem a bit steep for a newsletter, but Pinpoint "personalizes" each subscriber's newsletter by assembling items according to subscriber-specified areas of interest. And as a result of proprietary techniques, the newsletter comes across with crisp text, and clean gray screens—a distinct improvement over the fuzzy, blotchy appearance of most fax output.

Adobe Systems, developer of the PostScript page-description language, hopes to improve fax quality even more. The Mountain View, Calif., company is working on technology that can help a PostScript printer do double duty as a fax machine. Such a printer-fax could send PostScript documents only to a similarly equipped device. If it found a regular fax machine, it would transmit documents in standard CCITT Group 3 format at the best quality that the fax machine could produce.

PostScript faxes would have another advantage, aside from their print quality. Because PostScript documents are transmitted in ASCII format, which is more compressed than the Group 3 format, they transmit faster. If you're a heavy fax user, you'll save on phone costs.

—Jennifer Smith

PAUL WOLF

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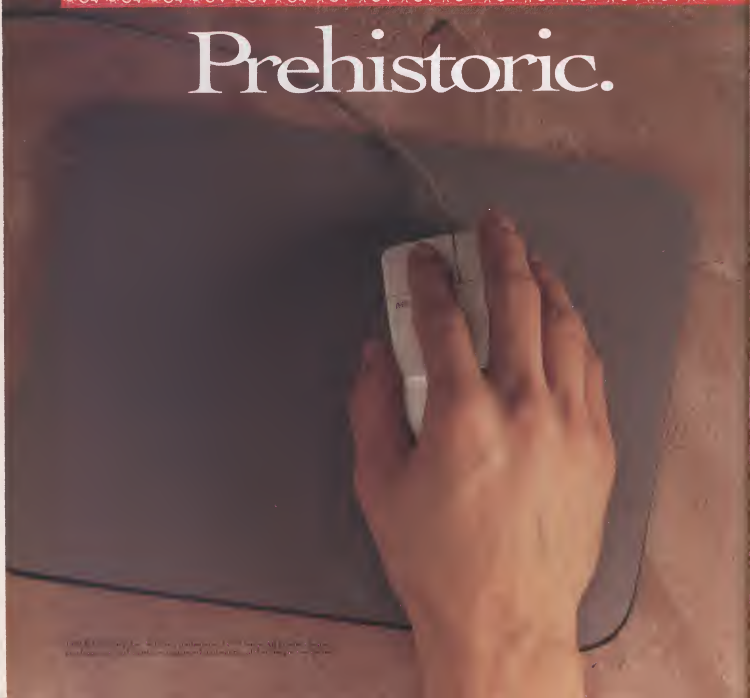
Usually, the technology available to computer users just plods along—with competing products repeating one another's so-called improvements.

But once in a blue moon there's a great leap of innovation. Something new appears that's so well thought out, so smart, that the way you work may never be the same again.

WIZ™ by CalComp, for example.

WIZ is an exciting new productivity tool. Combining the easy-to-use features of a mouse with the power of an "intelligent" graphics pad to enhance every pointing, tracing and drawing function you do.

WIZ meets the needs of virtually every Macintosh and PC user—from novice to advanced. Because WIZ gives you the convenience and flexibility of six programmable buttons, a cross-hair pointer and 1000 dpi for pinpoint accuracy, along with



[illegible]

a user-definable mouse area.

What's more, WIZ unleashes the full power and speed of your software. Optional templates for most major programs eliminate tedious pull-down or bar menus. Because WIZ templates put the commands you use most at your fingertips for instant access. And for the artist in you, WIZ offers an optional pen for drawing.

There's no rolling ball or moving parts. Nothing to clean. And WIZ has a five year warranty backed by CalComp, a world leader in computer graphics for over 30 years.

But the most amazing thing about WIZ is that you get it all for an introductory price under $200.

See WIZ at your local dealer or call 800-CALCOMP.

WIZ by CalComp. Everything else is just a mouse.

WIZ

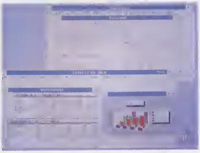
CIRCLE 110 ON READER SERVICE CARD

LOTUS AND WORDPERFECT UNITE UNDER OS/2 PM

In November, at Comdex/Fall '89, Lotus Development Corp. and WordPerfect Corp. (Orem, Utah) demonstrated the result of their year-long technology partnership: a common interface design for the two companies' respective OS/2 Presentation Manager applications, *1-2-3/G* and *WordPerfect*.

The two programs are consistent in their interface techniques. For example, both use structured dialog boxes, which let you issue commands in one of three ways: by pointing and clicking with a mouse, by typing the commands' first letters from the keyboard, or by using a combination of both the mouse and the keyboard.

1-2-3/G and *WordPerfect* for Presentation Manager will also share many of the same menu commands and dialog boxes. For example, both programs use the same commands to access Dynamic Data Exchange (DDE), an OS/2 protocol that controls the exchange of data between applications. "DDE is a low-level protocol, not a complete specification," says Lotus's Richard Wolf, architect of the *1-2-3/G* interface. "For example, it's up to the software developer to direct how a user should establish the link." Wolf says that Lotus would like to share its interface innovations with other software developers.



OS/2's Dynamic Data Exchange lets you move live data between *1-2-3/G* and *WordPerfect*.

The result of this dynamic integration is that you can, for example, incorporate a *1-2-3/G* spreadsheet into a *WordPerfect* document, change a value in the spreadsheet, and watch the corresponding data in the *WordPerfect* document be updated.

Other shared innovations include the ability to select colors from a palette of color options for text, background, and conditional data. For example, you can specify that all the numbers in your spreadsheet that meet the condition of being negative appear in red. The two programs also feature dialog boxes that let you preview font, point-size, and border selections before you execute the command.

Lotus expects to ship *1-2-3/G* in the first quarter. For a more complete description, see "A First Look at *1-2-3/G*, Lotus's Spreadsheet for OS/2 Presentation Manager" on page 6. WordPerfect Corp. expects to ship *WordPerfect* for Presentation Manager in the middle of the year. The program will include all the features that are available in the DOS version of *WordPerfect* 5.1.

LOTUS DEMOS 1-2-3 FOR DIGITAL'S VAX/VMS

In October, at the Info '89 trade show in New York City, Lotus Development Corp. demonstrated *1-2-3* for VAX/VMS. The program is based on *1-2-3* Release 3 technology and runs on Digital Equipment Corp.'s VAX/VMS computers.

The new program will work closely with Digital's All-In-1 integrated office system and will support Digital's Network Application Support services, including the DECwindows graphical user interface, VAX links to SQL databases, and the Compound Document Architecture file format. Lotus's DataLens technology, which provides access to external data from within Lotus applications, will allow users of *1-2-3* for VAX/VMS to integrate data from DEC's VAX Rdb/VMS relational database system and other relational databases into their spreadsheets.

"Enabling Digital customers to integrate *1-2-3* and share their information over the network, regardless of its physical or logical location, is key for both Lotus and Digital," says Frank Moss, vice president of Lotus's Networked Applications and Systems Division.

"The *1-2-3* PC user will be able to use *1-2-3* for VAX/VMS to access databases, consolidate networked spreadsheets, or mail spreadsheets and graphs around the world," adds Henry Ancona, Digital vice president of Business and Office Information Systems.

1-2-3 for VAX/VMS will be fully compatible with *1-2-3* Release 3 on the PC and other platforms and will be file-compatible with previous releases of *1-2-3*. With Digital's Personal Computing Systems Architecture, which lets MS-DOS-based PCs work in a VAX environment, you'll be able, for example, to import a WK1 file from a PC running *1-2-3* Release 2.2 into *1-2-3* for VAX/VMS, save it as a WK3 file, and create 3-D file links with Release 3 files on other network computers. At press time, Lotus had announced neither price nor ship date for *1-2-3* for VAX/VMS.

LOTUS SHIPS NETWORK VERSION OF RELEASE 2.2

Lotus expected to ship the network version of *1-2-3* Release 2.2 in December. The program is designed for use in networks compatible with DOS 3.1 and higher, including IBM PC LAN Programs 1.2 and 1.3, 3Com 3+Share 1.3, Novell SFT NetWare version 2.15, and Banyan Vines/3.0.

The Server Edition of the program, intended for installation on a network server, contains one software license, one set of program disks, one copy of the documentation, special network documentation, and network-administration software. The Node Edition provides an additional network license and set of documentation.

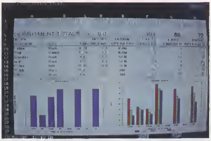
Suggested retail prices for Server and Node Editions are $595 and $295, respectively, for *1-2-3* Release 2.2. However, if you bought *1-2-3* Release 2.01 Networker between September 6, 1988 and December 31, 1989, you may upgrade free to *1-2-3* Release 2.2 or Release 3 network packages, which contain one Server Edition and four Node Editions. If you are eligible for a free upgrade, you must request it by March 31, 1990. For more information, call 1-800-TRADEUP.

LOTUS ANNOUNCES @FACTORY ADD-IN

In November Lotus Development Corp. announced *Lotus @Factory*, an add-in for *1-2-3* Releases 2.01 and 2.2. The program allows shop floor operators, engineers, and managers to access real-time factory-floor data from within a spreadsheet. The add-in is currently in beta testing, and it will be available in the first quarter at a suggested list price of $795.

@Factory allows *1-2-3* to connect to factory networks that conform to Manufacturing Automation Protocol (MAP) and Open Systems Interconnection (OSI) standards. The add-in lets you monitor and manage shop-floor activity by capturing production data accurately and automatically for immediate analysis with all the functions of *1-2-3*.

Via Manufacturing Message Specification (MMS) protocols and MAP-OSI networks, *@Factory* users can also exchange information with a wide variety of computers and computer-controlled machines, such as robots and bar-code readers. In addition, the combination of *1-2-3* and *@Factory* will allow programmers and developers to build factory applications, such as statistical process control, data collection, and production monitoring.



With *1-2-3* and *@Factory*, you can collect, graph, and analyze real-time data from the shop floor.

@Factory will be sold through value-added resellers and systems integrators, including Concord Communications (Marlboro, Mass.), a supplier of factory local-area MAP-OSI networks; Computrol (Ridgefield, Conn.), a provider of products and services for industrial local area networks; and Systems Integration Specialists Company (SISCO), of Warren, Mich., supplier of the popular *MMS-EASE* software.

@Factory runs with *1-2-3* Release 2.01 or Release 2.2 under DOS 2.0 or higher, on IBM PC XT, PC AT, PS/2, Compaq, and compatible systems with 640K of memory and a hard disk. You also need SISCO's *F/MAP-TSR* driver, a MAP V3.0 controller board, and a modem.

IN JAPAN, LOTUS SHIPS FREELANCE RELEASE 3J

Lotus Development Japan Ltd., Lotus's Japanese subsidiary, shipped *Freelance* Release 3J, a Japanese version of *Freelance Plus* 3.01, Lotus's business-graphics software package.

Freelance 3J is the first full-featured charting and drawing software package for the Japanese market. The most dramatic difference between the English and Japanese versions of *Freelance* is the alphabet. Because a standard keyboard cannot produce the tens of thousands of Japanese kanji (ideographic characters), *Freelance* 3J allows users to enter kanji by their phonetic pronounciation, as kana (Japanese phonetic characters). Kana-to-kanji conversion algorithms then convert the kana automatically to one of four kanji fonts.

Other differences show up in date types and charting features. *Freelance* 3J has 14 date types that conform to the Japanese date system, and it offers a second weekday date-interval option for the many Japanese companies that operate on a six-day workweek.

Charting features include two new chart types specific to Japan—Radar and Column charts—and some modifications to existing chart types. In addition, *Freelance* 3J's symbol library contains more than 200 new Japanese symbols and maps and 8 new fill patterns.

The program can import data from the Japanese versions of *1-2-3*, *Microsoft Multiplan*, and *dBase*. It can also exchange files with *Hanako* and *Kaede*, two popular Japanese graphics packages. An "image utility" allows *Freelance* 3J to import scanned images and convert files from other Japanese graphics software into TIFF files. And the program works with more than 20 Japanese output devices.

Freelance Release 3J is available now for the NEC PC-9800 series of computers. Separate versions for IBM Japan's PS/55 series, Fujitsu's FMR series, and Toshiba Corp.'s J-3100 series will be available soon. The suggested retail price is ¥98,000—about $695, depending on yen fluctuations.

Freelance 3J isn't sold in the United States. However, Ryo Yanagiya, head of development for Lotus Japan, expects that many Japanese companies will buy the program and ship it to their U.S. branches, as they have done with the Japanese version of *1-2-3*. ■

START HERE

SAY IT WITH PICTURES

Clarify your worksheets by graphing the data when numbers alone don't impart the message.

BY DANIEL GASTEIGER

The worksheet paradigm is easy to grasp. Laying out information in columns and rows simplifies almost any data. As a worksheet becomes more and more crowded, however, identifying important numbers and spotting trends becomes more challenging. To make matters worse, many people have difficulty drawing conclusions from numbers, no matter how the numbers are arranged.

1-2-3's graphing facility lets you address these issues. By using the Graph menus, you can tell *1-2-3* to display worksheet information in a graphical format. A graph might show sales revenue generated by territory, sales generated each month, individual expenditures as percentages of total expenditures, and so on.

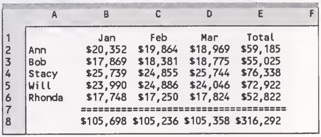
IS THIS ARTICLE FOR YOU?

Not all computers can display graphs. If you know that your computer's monitor can display text only, don't despair. You can still create graphs with *1-2-3*. You won't be able to view them on the display, but you will be able to save them on disk and print them on a graphics printer. On the other hand, if you don't have a graphics monitor and you don't have access to a graphics printer, you should probably give up on this article. You'll be able to issue all the commands, but you won't be able to view or print the results of your efforts.

If you don't know whether your computer can display graphs, follow along and you'll soon find out. The article contains a box titled Can Your Computer Display Graphs?, which helps you answer that question.

SOME DATA TO PLOT

Before you can make a graph, you must have some data in a worksheet. The following figure shows a worksheet containing data that you'll use in some sample graphs:



```
          A          B         C         D         E         F
1                   Jan       Feb       Mar      Total
2  Ann           $20,352   $19,864   $18,969   $59,185
3  Bob           $17,869   $18,381   $18,775   $55,025
4  Stacy         $25,739   $24,855   $25,744   $76,338
5  Will          $23,990   $24,886   $24,046   $72,922
6  Rhonda        $17,748   $17,250   $17,824   $52,822
7               ====================================
8               $105,698  $105,236  $105,358  $316,292
```

In a blank worksheet, enter the labels shown in rows 1 and 7 and in column A. To center the labels in row 1, precede each with a caret (^). To create the continuous double line in row 7, enter the backslash label prefix followed by an equal sign (\=) in cell B7. Copy cell B7 across the row. Press slash, select Copy, indicate cell B7 as the From range, and indicate range C7..E7 as the To range.

Enter the values in range B2..D6, omitting for now the dollar signs and commas. They will appear when you format the range. Enter the formula @SUM(B2..D2) in cell E2 and copy cell E2 to range E3..E6. Enter the formula @SUM(B2..B6) in cell B8 and copy cell B8 to range C8..E8.

Finally, assign all the numbers a currency format. To do this, select /Range Format Currency and enter 0. Then indicate range B2..E8 and press Return. Your worksheet should match ours. If you are confused by any of these procedures, review the first several installments of this column (March through August 1989) before you continue with this discussion on graphing.

YOUR FIRST GRAPH

From the data, you can see that sales in February were lower than sales in January. In March, sales increased a little, but not to the level they had in January. Let's build a graph that shows that.

Press slash and select Graph from the Main menu. Although the Graph menu offers many options, you can in

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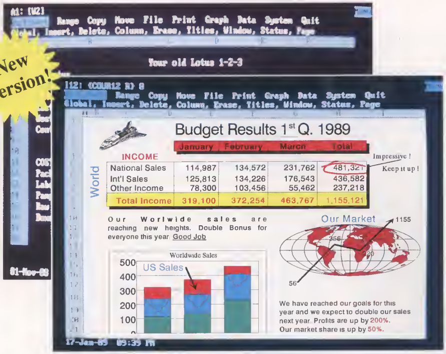
Daniel Gasteiger is a 1-2-3 *and* Symphony *consultant and a contributing editor to* LOTUS.

JIM LAMBRENOS

FOR 1-2-3®

New Version!



A1: [W2]
Range Copy Move File Print Graph Data System Quit
Global, Insert, Delete, Column, Erase, Titles, Window, Status, Page

Your old Lotus 1-2-3

I12: {COUR12 R} 0
Range Copy Move File Print Graph Data System Quit
Global, Insert, Delete, Column, Erase, Titles, Window, Status, Page

Budget Results 1st Q. 1989

INCOME	January	February	March	Total
National Sales	114,987	134,572	231,762	481,321
Int'l Sales	125,813	134,226	176,543	436,582
Other Income	78,300	103,456	55,462	237,218
Total Income	319,100	372,254	463,767	1,155,121

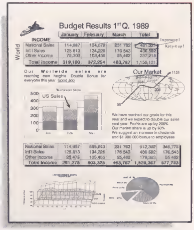
Impressive ! Keep it up !

Our Worldwide sales are reaching new heights. Double Bonus for everyone this year Good Job

We have reached our goals for this year and we expect to double our sales next year. Profits are up by 200%. Our market share is up by 50%.

17-Jan-89 05:35 PM

Lotus 1-2-3 stays fully active in graphics mode with IMPRESS. 1-2-3 works just like before, only now you have your own customized 1-2-3 screen display and reports.



What you see on your new 1-2-3 screen is what you get on paper.

This time - IMPRESS Them All!

The Ultimate in Desktop Publishing and Screen Management for 1-2-3

When your Lotus 1-2-3 worksheets look impressive so do you. IMPRESS from PC Publishing gives 1-2-3 true desktop publishing features that enable you to create eye-catching and persuasive worksheets.

1-2-3 Stays Fully Active

While in IMPRESS you can call all 1-2-3 commands and menus. You can also edit cells. (Unlike Allways you never need to revert back to text mode for editing cells.)

Mouse Support and Drawing Tool Box

IMPRESS brings a true graphic interface to Lotus 1-2-3. Full mouse support to call menus or open windows. Even a drawing tool box that allows you to draw any image in 1-2-3. Get a professional look quickly and easily without ever leaving 1-2-3.

Compress or Enlarge Worksheets

You can customize your 1-2-3 screen display with drawings, colors, grids and new exciting fonts. You can also zoom in and out to compress worksheets or enlarge them. See twice as many rows and columns of your worksheets on screen. No more scrolling around.

Mix Numbers, Text and Graphics

Create a professional report with numbers, graphs, images and text all on one page. Your graphs are customized. Your text automatically word wraps and is justified. You have a choice of different type styles and sizes with different fonts (3 pts. to 72 pts.) Your images are created with the drawing tool box or imported from Freelance.

Print Sideways

Print sideways with all printers from dot matrix to laser and desk jets. Print exciting colorful reports with color printers. IMPRESS can also compress worksheets automatically so they fit any page size you want.

Customize Graphs or Forms

Graphs can be real time synchronized with your worksheet. You can also include .PIC files or Freelance files. Customize your 1-2-3 graphs with arrows, explanations, fancy titles and drawings. Draw lines, boxes, grids or even freehand to create any form or invoice from inside 1-2-3. Then fill up your forms on screen and simply print them.

Easy to Use

If you know how to use 1-2-3, you already know how to use IMPRESS, it's fast and easy. There is no learning period. IMPRESS uses 1-2-3 like menus that you are already familiar with.

Allways and 1-2-3 Rel 2.0, 2.1, 2.2 Compatibility

IMPRESS imports Allways files automatically. So you can improve them, print them sideways, or simply work on them without having to toggle to text mode. IMPRESS works with 1-2-3 Rel 2.0, 2.1, & 2.2.

"Works magic . . . the tremendous improvement over 1-2-3's screens and reports is obvious."
— Lotus Magazine 3/89

Technical Requirements

IMPRESS works with: *1-2-3 release 2.0, 2.1 or 2.2, DOS 2.0 or later, CGA, EGA, VGA or Hercules (No color in CGA) Supports all graphics printers that work with 1-2-3: including Dot Matrix, Plotters, Desk Jet, Laser printers (Hewlett Packard, Postscript, etc. .), Color printers. IMPRESS occupies 93k RAM above 1-2-3 (uses EMS if available). 1-2-3 is a registered trademark of Lotus. Allways is a registered trademark of Funk*

	Allways	IMPRESS
1-2-3 stays fully functional & interactive	No	Yes
Enhance & customize 1-2-3 screen display	No	Yes
Print sideways on all printers	No	Yes
Synchronized live graphs	No	Yes
See more rows & columns on screen	No	Yes
Drawing tool box	No	Yes
Import Freelance images or graphs	No	Yes
Word processing capabilities	No	Yes
Customize graphs with arrows, frames, drawings	No	Yes
Full mouse support	No	Yes

"Which is better? . . . IMPRESS is the clear winner. It boasts nearly every additional feature I wished for when I reviewed Allways."
— PC Magazine 5/16/89

"IMPRESS . . . a clear leader worthy of an excellent score. If you like Allways, you'll love IMPRESS."
— Infoworld 9/4/89

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CIRCLE 113 ON READER SERVICE CARD

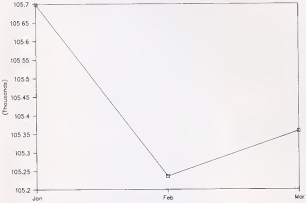
fact create a simple graph by using only two choices.

A simple line graph, the default graph type in *1-2-3*, plots a set of Y values at fixed intervals along an X axis. The X axis runs across the bottom of the graph, and the Y axis runs down the left-hand side of the graph. To establish the interval along the X axis, you specify a worksheet range. The number of cells in the X-axis range should match the number of cells in each successive range of Y values that you specify.

This may sound a little confusing now, but it makes sense when you actually create the graph. Select X from the menu and specify range B1..D1. This tells *1-2-3* to display the contents of range B1..D1 along the X axis of the graph. Now select A from the menu and specify range B8..D8. This tells *1-2-3* to plot each value in range B8..D8 as a Y value that coincides with a point on the X axis.

Select View from the Graph menu. If your computer beeps and the display remains unchanged, save the worksheet so that you can come back to it later. Then read the box on page 31 and try to determine whether or not your computer can display graphs.

If a graph appears, it will look like the one shown below. Depending on which release of *1-2-3* you're using, the end points of the graphed data may fall on the graph's borders and the values along the Y axis may be slightly different.



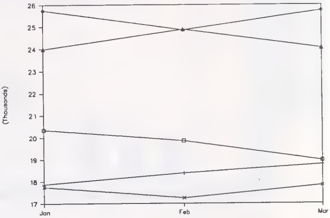
In any case, you can clearly see that there was some fluctuation in the total sales from January through March. In fact, the amount of change is quite exaggerated in this graph because *1-2-3* automatically scales the Y axis to allow you to get a close look at any variations. The Y-axis values from 0 through 105,000 don't even appear. If values from 0 to 105,700 were visible on the Y axis, the plotted data would appear as a nearly straight line.

The graph remains visible until you press any key. Press one now, and *1-2-3* redisplays the main Graph menu.

A FEW MORE GRAPHS

The graph you just viewed wasn't particularly interesting. To gain a better sense of the usefulness of graphs, let's make one that compares salespeople's revenues for the months of January, February, and March.

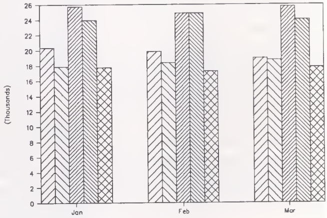
Select Reset A Quit to eliminate the current setting for the graph's A data range. Then select A and indicate range B2..D2 as the graph's A range. Select B and indicate range B3..D3. Select C and indicate range B4..D4. Select D and indicate B5..D5. Select E and indicate range B6..D6. You've just told *1-2-3* to plot each salesperson's revenues by month. Now select View to see the result.



It's not pretty. You can see five lines representing five sets of data. But which line represents which sales person is a mystery. In fact, because there is so little data, a line graph poorly represents the information.

Fortunately, a line graph is only one of several types of graphs that you can create with *1-2-3*. In fact, this data will look much better as a bar graph. Press a key to clear the display, then select Type from the Graph menu.

A menu of graph types appears. A later installment of Start Here will examine all of them. For now, select Bar, then select View from the main Graph menu. The following graph appears:



Each cluster of bars represents one month, as indicated by the labels along the X axis. The leftmost bar of each cluster represents a value in the graph's A data range. The next bar to the right represents a value in the B range, and so on. If you remember the order of the salespeople in the worksheet, you can compare their sales.

Even this graph isn't the best representation of the data. Many other commands on the Graph menu let you enhance a graph's appearance. For example, you can add titles that appear above the entire graph and along the X and Y axes. You can also add a legend that identifies what each graphic element represents. For now, press any key to return to the Graph menu, and then select Quit. Use the File Save command to save the worksheet. You'll use this worksheet to explore graphing options in upcoming Start Here columns. ■

CAN YOUR COMPUTER DISPLAY GRAPHS?

Computer monitors have two modes of operation: text mode and graphics mode. In text mode, a monitor displays only a limited set of predefined characters. Typically, a monitor in text mode has 80 character spaces in each of 25 rows. Software makes text appear on the monitor by sending a code that identifies which character should appear in which space.

On the other hand, a monitor in graphics mode can display any arrangement of images you might request. When the monitor is in graphics mode, your computer can control each one of thousands of little dots called pixels. Early graphics monitors, such as the CGA, the most common standard, could display 320 by 200 pixels in four colors and 640 by 200 pixels in two colors. Newer monitors, such as the EGA and VGA, can display more pixels in the same screen area, thus letting you create sharper, more-detailed images.

Having a monitor capable of certain types of operating modes is only part of the graphics picture. Your computer must also contain a video display adapter, which is also known as a graphics card. This is a board that provides a way for your computer to address your monitor. Software sends information to the adapter, which in turn sends a signal to the monitor.

The display adapter in your computer probably already works with your computer's monitor. If it didn't, you wouldn't even be able to view a *1-2-3* spreadsheet. However, if *1-2-3* doesn't display graphs on command, it may be that either your monitor or your graphics card works only in text mode.

Before you continue with this discussion, try to find out what type of graphics card you use.

Return to Install

If you know that your computer has the ability to display graphics, the problem lies with the way you installed *1-2-3*. When you install *1-2-3*, you specify the type of monitor and graphics card the computer uses. If you incorrectly specify your graphics card, *1-2-3* may be unable to show graphs.

To alter the graphics-display capability of your software, save your work and select /Quit Yes to exit *1-2-3*. If the Access System menu appears, select Install. If the DOS prompt appears, make current the directory that holds your *1-2-3* program files.

To make a directory current, enter the command *cd\ dirname* where *dirname* identifies the directory. For example, if the *1-2-3* program files are in a directory named LOTUS, enter the DOS command *cd\ lotus*. Then enter *install*. If you start *1-2-3* from a floppy disk, insert the Utility Disk (in *1-2-3* Release 2.2, the Install Disk) in drive A and enter *install* at the A> prompt. For more on DOS, see the Journey Through DOS series in the October, November, and December 1987 issues of *LOTUS*.

Make the Right Choice

An introductory screen appears with information about the Install program. When the software instructs you to do so, press Return, then select Change Selected Equipment from the Main menu. Select Screen Display from the next menu and specify whether you have one or two monitors connected to your computer.

Next, the Install program offers a list of the types of monitors and graphics cards that *1-2-3* can use. Look at the list on the left side of the screen for your monitor and type of graphics card. The right side of the screen gives a brief description of each monitor and graphics card. When you find the option that you need to specify, highlight it and press Return. Then select Save Changes and follow on-screen prompts to save the new driver set and to exit the Install program. The Install program has very complete prompts, instructions, and help screens. If you read carefully as you use the program, you should have no trouble following the procedures to select a display adapter and to save the modified driver set.

If you try to restart *1-2-3* and get an error message or a blank screen that has a blinking cursor, you probably selected the wrong graphics card. To correct this condition, rerun the Install program. If you still don't know which graphics card your computer has, select First Time Installation from the Install program's Main menu and answer no to the question *Can your computer display graphs?* Complete First Time Installation by answering the questions about printers. Then follow the prompts to save your driver set and to exit the Install program. You'll be able to reload *1-2-3* and use the spreadsheet, but you won't be able to view a graph.

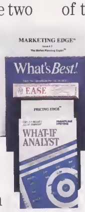
If you reload *1-2-3* and it still won't display graphs even though you know that your hardware should be capable of doing so, it's time to get help. Talk with your local hardware-support people or with the dealer who sold you the hardware. Alternatively, the manufacturer of your monitor might be able to tell you which graphics boards work with the monitor. And the manufacturer of your graphics board should know what monitors work with the board.

The New Lotus 1-2-3.

Even the best tool can be made more useful when you tailor it to meet your specific needs.

And Lotus® 1-2-3® is no exception. The two newest versions of 1-2-3, Release 3 and Release 2.2, are the most powerful, versatile spreadsheets in the world. In fact, *Software Digest*®'s Ratings Report for 1989 has given 1-2-3 the *highest overall evaluation* for the sixth consecutive year.

Yet even with all that power, Release 3 and Release 2.2 can attack your specific problems even more effectively when they're paired with add-in products that can help to extend and customize the functionality of 1-2-3.



So, the millions of 1-2-3 users who've been using add-ins will be happy to know that most of them will also work with Release 2.2. And there are lots of useful new enhancement products designed specifically to work with Release 3, with more on the way.

No other spreadsheet can be customized as many ways as Lotus 1-2-3. Here are some examples of great add-ins for Release 3 or Release 2.2:

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© 1989 Lotus Development Corporation Lotus, Lotus Selects and 1-2-3 are registered trademarks of Lotus Development Corporation @*EASE* is a trademark of Spreadsheet Solutions *Software Digest*® is a registered trademark of National Software Testing Laboratories, Inc 1-2-3 Release 3 runs under DOS or OS/2 Hard disk and 1Mb system memory required in DOS, 3Mb in OS/2 Lotus certified compatible PC AT with 80286/80386 processor required 1-2-3 Release 2.2 runs on Lotus certified PCs of all types in DOS with a minimum of 320K system memory Prices and availability of add-in products subject to change

The New Lotus 1-2-3 with add-ins.

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And *What'sBest!,*** from General Optimization, which enables you to find the mathematically optimal solution to maximize profits, minimize costs and optimize resource allocation.

For information on how to order these enhancement products, **call Lotus Selects® at 1-800-635-6887,** Monday through Friday 8:30AM to 8:00PM EST.

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*Available for Release 2.2 and Release 3.**Currently available for Release 2.2 only. Soon to be available for Release 3.

MACROS CAN SPEED UP YOUR WORK WITH 1-2-3 ADD-INS

Let macros automate procedures when you use programs like *Allways*.

BY NICK DELONAS

Independent, third-party developers have created all sorts of software to work with your *1-2-3* spreadsheet—word processors, databases, graphics packages, and so on. With all the expanded power that add-ins provide, wouldn't it be nice to speed up that functionality with macros? Often, you can. As an example, we'll show you how a macro can execute commands within the popular add-in program *Allways*. The principles used in this example apply to most of the add-in packages you'll be using.

THE BASICS OF ADD-INS

Before we show you how to use macros with add-ins, it's important that you understand something about add-ins.

You load and use add-in programs from within *1-2-3* via the add-in menu. For *1-2-3* Release 2.01 you also need a program called the *1-2-3* Add-In Manager. Every add-in you purchase should supply a copy of the Add-In Manager, along with installation instructions. When you install the Add-In Manager, it becomes part of your Lotus driver set, which is a file that tells *1-2-3* which hardware drivers to use. These drivers let *1-2-3* work properly with your particular computer and peripherals. You create the driver set when you run the Install program that comes with your *1-2-3* package.

The Add-In Manager assigns the add-in menu to the ADDIN key (Alt-F10 on most computers). Then from within *1-2-3* you can press the ADDIN key to attach add-in programs. You just press the ADDIN key, select Attach from the menu, highlight the name of the add-in you want, and press Return. You can assign an add-in to one of three application keys: APP1 (Alt-F7), APP2 (Alt-F8), and APP3 (Alt-F9). When you want to invoke an add-in, you just press the application key to which you assigned it.

The add-in menu is part of *1-2-3* Release 2.2. So you don't have to install the Add-In Manager to use an add-in program with that release. You can access the add-in menu with the ADDIN key or by selecting /Add-In.

The add-in menu has five commands: Attach, Detach, Invoke, Clear, and Quit. The add-in menu for Release 2.01's Add-In Manager has an additional command: Setup. The Setup command lets you specify add-ins that *1-2-3* will load automatically. In Release 2.2 you set up the autoload add-ins by selecting /Worksheet Global Default Other Add-In Set. In both releases the add-in menu's Attach option loads an add-in into memory, Detach removes an add-in from memory, Invoke starts an add-in, Clear removes all removable add-ins from memory, and Quit exits the Add-In Manager.

In *1-2-3* Release 3 you use the same ADDIN key as in Releases 2.01 and 2.2. The menu, however, is different. You can select Load, Remove, Invoke, Table, Clear, Settings, and Quit. The different menu serves to remind you that Release 3 cannot use the add-ins developed for Releases 2.01 or 2.2: Release 3 works with add-ins developed by using the recently released *Lotus Add-In Toolkit*. Releases 2.01 and 2.2 work with add-ins created by using *Lotus Developer Tools*, which Lotus Development Corp. released in December 1986.

Releases 2.01 (with the Add-In Manager installed) and 2.2 include two @functions that let a macro determine if an add-in is attached or if an add-in @function is available. These @functions are @ISAPP and @ISAAF.

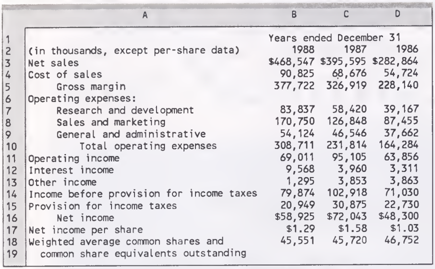
@ISAPP(*"add-in name"*) checks whether the specified add-in is attached. For example, @ISAPP("allways") returns 1 if you have ALLWAYS.ADN attached and 0 if not.

@ISAAF(*"add-in @function"*) checks whether the specified add-in @function is attached. If you have an add-in that has an @FACTOR function, @ISAAF("factor") returns 1 if that @function is available and 0 if not.

There are four macro commands designed to work with add-ins: {APP1}, {APP2}, {APP3}, and {APP4}. A macro can access the add-in menu with the command keyword {APP4}. The {APP4} command is the equivalent of manually pressing the ADDIN key. It works in Release 2.01 with the Add-In Manager and in Releases 2.2 and 3. Likewise, the command keyword {APP1} is equivalent to the APP1 key. It can invoke an add-in assigned to the APP1 key. The {APP2} command corresponds to the APP2 key and {APP3} corresponds to the APP3 key.

PUTTING A MACRO TO WORK

Let's say you regularly use *Allways* to format an income statement. You import the income statement into a work-



```
                    A                           B         C         D
 1                                      Years ended December 31
 2  (in thousands, except per-share data)      1988      1987      1986
 3  Net sales                              $468,547  $395,595  $282,864
 4  Cost of sales                            90,825    68,676    54,724
 5       Gross margin                       377,722   326,919   228,140
 6  Operating expenses:
 7       Research and development            83,837    58,420    39,167
 8       Sales and marketing                170,750   126,848    87,455
 9       General and administrative          54,124    46,546    37,662
10            Total operating expenses      308,711   231,814   164,284
11  Operating income                         69,011    95,105    63,856
12  Interest income                           9,568     3,960     3,311
13  Other income                              1,295     3,853     3,863
14  Income before provision for income taxes 79,874  102,918    71,030
15  Provision for income taxes               20,949    30,875    22,730
16       Net income                         $58,925   $72,043   $48,300
17  Net income per share                      $1.29     $1.58     $1.03
18  Weighted average common shares and       45,551    45,720    46,752
19    common share equivalents outstanding
```

FIGURE 1. This *1-2-3* worksheet contains the formatted data in an income statement. Range A1..D19 is named *report*. Our macro will use *Allways* to format it for printing.

sheet, as shown in figure 1, and then you use *Allways* to format it so that it prints out as shown in figure 2.

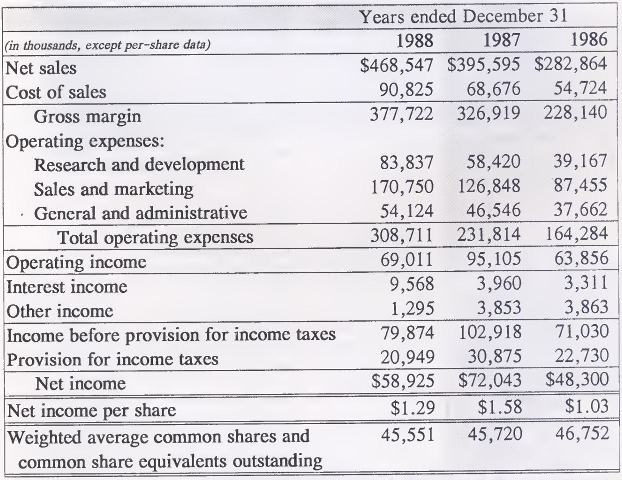
Allways is easy to use, but why repeat the same formatting operations again and again when a macro can do the job? The macro shown in figure 3 shows how you can automate a formatting procedure.

With the cell pointer in column A, select /Worksheet Column Set-Width and enter 42. Enter all labels and values shown in figure 1. Select /Worksheet Global Format, type a comma, and then enter 0. Select /Range Format Currency, enter 0, and indicate range B3..D3. Use the same command to format range B16..D16. Format range B17..D17 for currency with two decimal places. Then assign the General format to range B2..D2.

Now select /Range Name Create, enter *report*, and indicate range A1..D19. Enter all labels shown in figure 3. Then select /Range Name Labels Right and indicate range M1..M13.

To run the macro, hold down the MACRO key (Alt on most computers) and press G. The macro loads *Allways* if it isn't already in memory and then formats the information in the range named *report*. Here's how it works:

{GOTO}report~ moves the cell pointer to the upper-left corner of the range named *report*.



	Years ended December 31		
(in thousands, except per-share data)	1988	1987	1986
Net sales	$468,547	$395,595	$282,864
Cost of sales	90,825	68,676	54,724
Gross margin	377,722	326,919	228,140
Operating expenses:			
Research and development	83,837	58,420	39,167
Sales and marketing	170,750	126,848	87,455
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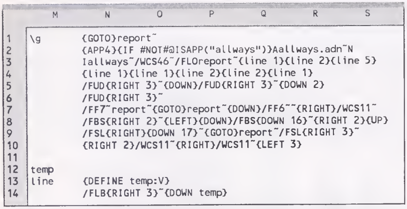
Provision for income taxes	20,949	30,875	22,730
Net income	$58,925	$72,043	$48,300
Net income per share	$1.29	$1.58	$1.03
Weighted average common shares and common share equivalents outstanding	45,551	45,720	46,752

FIGURE 2. The printed information from figure 1 after it was formatted with our macro (see figure 3), which invokes *Allways* and works within it



```
     M         N         O         P         Q         R         S
1   \g        {GOTO}report~
2             {APP4}{IF #NOT#@ISAPP("allways")}Aallways.adn~N
3             Iallways~/WCS46~/FLOreport~{line 1}{line 2}{line 5}
4             {line 1}{line 1}{line 2}{line 2}{line 1}
5             /FUD{RIGHT 3}~{DOWN}/FUD{RIGHT 3}~{DOWN 2}
6             /FUD{RIGHT 3}~
7             /FF7~report~{GOTO}report~{DOWN}/FF6~~{RIGHT}/WCS11~
8             /FBS{RIGHT 2}~{LEFT}{DOWN}/FBS{DOWN 16}~{RIGHT 2}{UP}
9             /FSL{RIGHT}{DOWN 17}~{GOTO}report~/FSL{RIGHT 3}~
10            {RIGHT 2}/WCS11~{RIGHT}/WCS11~{LEFT 3}
11
12  temp
13  line      {DEFINE temp:V}
14            /FLB{RIGHT 3}~{DOWN temp}
```

FIGURE 3. This macro uses *Allways* to format the information shown in figure 1 so that it can be printed as shown in figure 2.

{APP4}{IF #NOT#@ISAPP("allways")}Aallways .adn~N uses @ISAPP to determine whether *Allways* is attached. The @ISAPP("allways") formula returns 1 if *Allways* is in memory and 0 if it isn't. If it isn't attached, the macro attaches it. The {APP4} command displays the add-in menu. The macro selects Attach and indicates ALLWAYS .ADN. Then when *1-2-3* asks to which application key it should assign *Allways*, the macro selects No-Key by typing the letter N.

Iallways~/WCS46~/FLOreport~{line 1}{line 2}{line 5} invokes *Allways* from the add-in menu. The macro then proceeds to issue commands inside the *Allways* environment. It uses the Worksheet Column Set-Width command to adjust the width of the first column in the range named *report*. The macro uses the Format Lines Outline command to draw a box around *report*. Then it calls the subroutine *line* three times, with the arguments 1, 2, and 5, respectively. Here's what the *line* subroutine does:

{DEFINE temp:V} stores the argument from the subroutine call as a value in the cell named *temp*.

/FLB{RIGHT 3}~{DOWN temp} draws a line under the current row with the Format Lines Bottom command. The macro then moves the cell pointer down as many rows as the value stored in *temp*.

{line 1}{line 1}{line 2}{line 2}{line 1} calls the *line* routine six times with various arguments that depend on how many lines down you wish to move the cell pointer after underlining the current row.

/FUD{RIGHT 3}~{DOWN}/FUD{RIGHT 3}~{DOWN 2} uses the Format Underline Double command to draw a double line under the cells in the current row. The macro then moves the cell pointer down a row and draws a double line under the current row. Next, the macro moves the pointer down two rows.

/FUD{RIGHT 3}~ draws a double line under the current row.

/FF7~report~{GOTO}report~{DOWN} /FF6 ~~{RIGHT}/WCS11~ assigns Font 7, or the default of Times 14 point, to the range named *report*. The macro moves the cell pointer to one cell below the upper-left corner of the *report* range. It assigns Font 6, or Times Italic 10 point, to the current cell. The macro then moves the pointer one cell to the right and sets the column width to 11.

/FBS{RIGHT 2}~{LEFT}{DOWN}/FBS {DOWN 16}~{RIGHT 2}{UP} uses the Format Bold Set command to set the dates above the columns of figures into bold type. The macro moves the pointer down and to the left. It then sets all the labels, from *Net sales* to *Weighted average common shares and common share equivalents outstanding*, into bold type. Then the macro moves the cell pointer two columns to the right and one row up.

/FSL{RIGHT}{DOWN 17}~{GOTO}report ~/FSL{RIGHT 3}~ uses the *Allways* Format Shade Light command to shade the two rightmost columns, starting in the second row of the *report* range and continuing down 17 rows. The macro then moves the cell pointer to the upper-left corner of *report* and shades the first row of that range.

{RIGHT 2}/WCS11~{RIGHT}/WCS11~{LEFT 3} sets the width of the two rightmost columns to 11 and returns the cell pointer to the top-left corner of the *report* range. ■

Some Useful Conventions

Our examples use uppercase letters for macro commands and lowercase letters for range names and addresses used by the macros ({BRANCH address}). Whenever possible, range names appear to the left of the named cells. This helps to identify named cells and is especially useful if you want to use the File Combine command to copy a macro from one worksheet into another. You can reassign all the range names in one step by using the Range Name Labels Right command.

Remember, when you enter macro steps that start with a slash (/), a label-prefix character such as a backslash (\), or any arithmetic operators (+, −, *, etc.), place an apostrophe (') before the entry or you may get unexpected results.

Why Use Range Names?

When you type a command as a label, cell references within the command are meaningless to *1-2-3* until it processes the macro. For example, if your macro uses the command /Cb3~h20~ to copy information from a table and you move the table to another part of the worksheet, your macro no longer copies the proper information. If, however, you have named the cells *source* and *destination* and the macro command is /Csource~destination~, moving the table that contains these cells does not adversely affect the macro. It's also much easier to edit a worksheet later if you've used range names instead of cell references in your macro code.

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SYMPHONY MACROS

FROM TABLE TO FORM IN A SNAP

Build a macro that transforms a simple table into a *Symphony* database.

BY NICK DELONAS

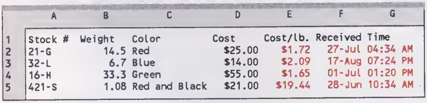
From last month's 1-2-3 Macros column, you learned how to use a macro to set up a *1-2-3* database. This month you'll learn how to use a macro to set up a *Symphony* database.

Symphony's FORM environment provides a simple method for creating databases—the Generate command. Unfortunately, this command creates only new databases. It can't take an existing table and set up the many ranges and settings required to use it in the FORM environment.

If you've ever wished for an easier way to convert a table to a FORM-window database, then add this month's macro to your macro library. You may even find the macro an easier way to create new databases than the FORM window's Generate command.

Imagine that you work with the table in figure 1.

Let's say you decide to use *Symphony*'s FORM environ-

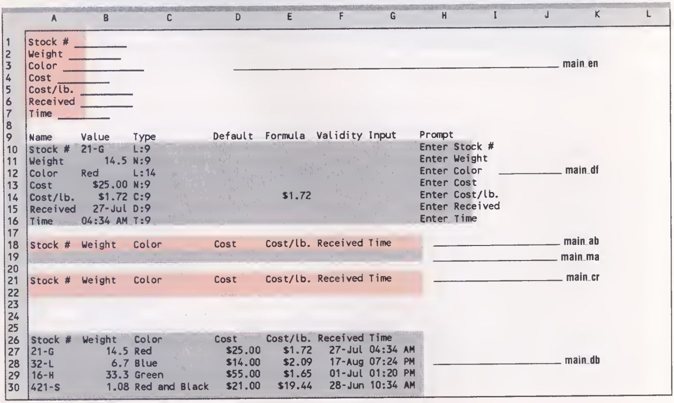


```
     A         B          C              D         E         F        G

1  Stock #  Weight   Color           Cost      Cost/lb.  Received Time
2  21-G         14.5 Red              $25.00     $1.72   27-Jul 04:34 AM
3  32-L          6.7 Blue             $14.00     $2.09   17-Aug 07:24 PM
4  16-H         33.3 Green            $55.00     $1.65   01-Jul 01:20 PM
5  421-S        1.08 Red and Black    $21.00    $19.44   28-Jun 10:34 AM
```

◄ FIGURE 1

▼ FIGURE 2



```
     A         B          C              D         E         F        G         H         I         J         K         L

1  Stock # _________
2  Weight _________
3  Color _____________
4  Cost _________
5  Cost/lb. _________
6  Received _________
7  Time _________
8
9  Name     Value     Type            Default  Formula  Validity Input    Prompt
10 Stock #  21-G      L:9                                                 Enter Stock #
11 Weight       14.5  N:9                                                 Enter Weight
12 Color    Red       L:14                                                Enter Color
13 Cost       $25.00  N:9                                                 Enter Cost
14 Cost/lb.    $1.72  C:9                       $1.72                     Enter Cost/lb.
15 Received   27-Jul  D:9                                                 Enter Received
16 Time     04:34 AM  T:9                                                 Enter Time
17
18 Stock #  Weight    Color           Cost      Cost/lb. Received Time
19
20
21 Stock #  Weight    Color           Cost      Cost/lb. Received Time
22
23
24
25
26 Stock #  Weight    Color           Cost      Cost/lb. Received Time
27 21-G         14.5  Red              $25.00     $1.72   27-Jul 04:34 AM
28 32-L          6.7  Blue             $14.00     $2.09   17-Aug 07:24 PM
29 16-H         33.3  Green            $55.00     $1.65   01-Jul 01:20 PM
30 421-S        1.08  Red and Black    $21.00    $19.44   28-Jun 10:34 AM
```

ment to enter new data. Again, you can't use the FORM window's Generate command because the table already exists. You could, however, insert some blank rows and then create and assign all the necessary ranges, as shown in figure 2. But that's a big job. This kind of problem is fairly common, especially if you exchange files with *1-2-3* users.

Our macro inserts as many blank rows as are necessary to hold the requisite ranges. It creates those ranges and names them. It fills in all the labels and data, even re-creating any formulas it finds in the original data table. Finally, it switches to the FORM environment so that you can proceed with database operations.

CREATING THE MACRO

In a blank worksheet, enter all labels shown in figure 3. Begin the entries in range B10..B11 with a space character. Omit, for now, the text printed in red in cell B24. That is the result of a string formula that we'll enter in a moment.

Assign the labels in column A as range names for the adjacent cells in column B: In the SHEET environment, press MENU, select Range Name Labels Right, indicate range A1..A70, and press Return.

Enter the following formula in cell B24:

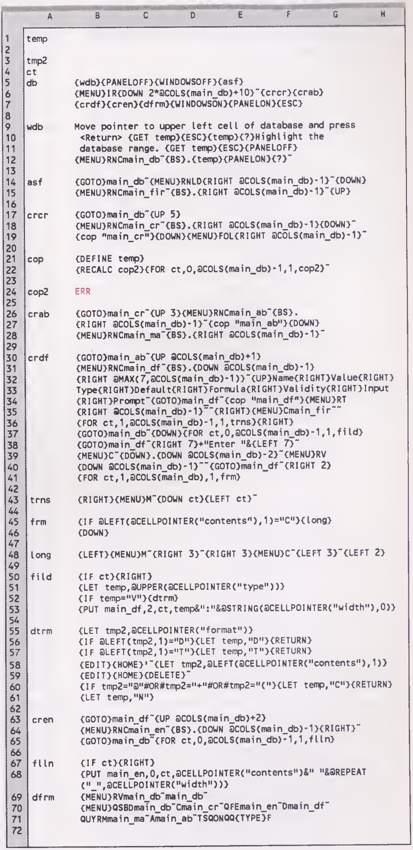
```
+"{PUT "&@CELL("contents",temp)&
  ",ct,0,@INDEX(main_db,ct,0)}"
```

Now save the macro into a macro library: Press SERVICES and select Application Attach. Select MACROMGR.APP. Select Quit. Press SERVICES, select Macros Save, and enter *database* as the name for the macro library. Indicate range A1..B72 and then select No. The macro is now in *Symphony*'s Hyperspace and available for use.

To bring the macro into memory in a future session, first attach the MACROMGR file. Then press SERVICES, select Macros Load, indicate DATABASE, press Return, and select Quit.

Let's test the macro on the table shown in figure 1. Select SERVICES New Yes. Move the cell pointer to column C. Press MENU, select Width Set, and enter 14. Then enter all labels and values shown in figure 1. The text printed in red in column E is the result of formulas. Enter the formula @ROUND(D2/B2,2) in cell E2 and copy that formula to range E3..E5.

Enter the dates in column F by using the @DATE function. For example, in cell F2 en-



```
        A         B         C         D         E         F         G         H
 1  temp
 2
 3  tmp2
 4  ct
 5  db        {wdb}{PANELOFF}{WINDOWSOFF}{asf}
 6            {MENU}IR{DOWN 2*@COLS(main_db)+10}~{crcr}{crab}
 7            {crdf}{cren}{dfrm}{WINDOWSON}{PANELON}{ESC}
 8
 9  wdb       Move pointer to upper left cell of database and press
10             <Return> {GET temp}{ESC}{temp}{?}Highlight the
11             database range. {GET temp}{ESC}{PANELOFF}
12            {MENU}RNCmain_db~{BS}.{temp}{PANELON}{?}~
13
14  asf       {GOTO}main_db~{MENU}RNLD{RIGHT @COLS(main_db)-1}~{DOWN}
15            {MENU}RNCmain_fir~{BS}.{RIGHT @COLS(main_db)-1}~{UP}
16
17  crcr      {GOTO}main_db~{UP 5}
18            {MENU}RNCmain_cr~{BS}.{RIGHT @COLS(main_db)-1}{DOWN}~
19            {cop "main_cr"}{DOWN}{MENU}FOL{RIGHT @COLS(main_db)-1}~
20
21  cop       {DEFINE temp}
22            {RECALC cop2}{FOR ct,0,@COLS(main_db)-1,1,cop2}~
23
24  cop2      ERR
25
26  crab      {GOTO}main_cr~{UP 3}{MENU}RNCmain_ab~{BS}.
27            {RIGHT @COLS(main_db)-1}~{cop "main_ab"}{DOWN}
28            {MENU}RNCmain_ma~{BS}.{RIGHT @COLS(main_db)-1}~
29
30  crdf      {GOTO}main_ab~{UP @COLS(main_db)+1}
31            {MENU}RNCmain_df~{BS}.{DOWN @COLS(main_db)-1}
32            {RIGHT @MAX(7,@COLS(main_db)-1)}~{UP}Name{RIGHT}Value{RIGHT}
33            Type{RIGHT}Default{RIGHT}Formula{RIGHT}Validity{RIGHT}Input
34            {RIGHT}Prompt~{GOTO}main_df~{cop "main_df"}{MENU}RT
35            {RIGHT @COLS(main_db)-1}~~{RIGHT}{MENU}Cmain_fir~~
36            {FOR ct,1,@COLS(main_db)-1,1,trns}{RIGHT}
37            {GOTO}main_db~{DOWN}{FOR ct,0,@COLS(main_db)-1,1,fild}
38            {GOTO}main_df~{RIGHT 7}+"Enter "&{LEFT 7}~
39            {MENU}C~{DOWN}.{DOWN @COLS(main_db)-2}~{MENU}RV
40            {DOWN @COLS(main_db)-1}~~{GOTO}main_df~{RIGHT 2}
41            {FOR ct,1,@COLS(main_db),1,frm}
42
43  trns      {RIGHT}{MENU}M~{DOWN ct}{LEFT ct}~
44
45  frm       {IF @LEFT(@CELLPOINTER("contents"),1)="C"}{long}
46            {DOWN}
47
48  long      {LEFT}{MENU}M~{RIGHT 3}~{RIGHT 3}{MENU}C~{LEFT 3}~{LEFT 2}
49
50  fild      {IF ct}{RIGHT}
51            {LET temp,@UPPER(@CELLPOINTER("type"))}
52            {IF temp="V"}{dtrm}
53            {PUT main_df,2,ct,temp&":"&@STRING(@CELLPOINTER("width"),0)}
54
55  dtrm      {LET tmp2,@CELLPOINTER("format")}
56            {IF @LEFT(tmp2,1)="D"}{LET temp,"D"}{RETURN}
57            {IF @LEFT(tmp2,1)="T"}{LET temp,"T"}{RETURN}
58            {EDIT}{HOME}'~{LET tmp2,@LEFT(@CELLPOINTER("contents"),1)}
59            {EDIT}{HOME}{DELETE}~
60            {IF tmp2="@"#OR#tmp2="+"#OR#tmp2="("}{LET temp,"C"}{RETURN}
61            {LET temp,"N"}
62
63  cren      {GOTO}main_df~{UP @COLS(main_db)+2}
64            {MENU}RNCmain_en~{BS}.{DOWN @COLS(main_db)-1}{RIGHT}~
65            {GOTO}main_db~{FOR ct,0,@COLS(main_db)-1,1,flln}
66
67  flln      {IF ct}{RIGHT}
68            {PUT main_en,0,ct,@CELLPOINTER("contents")&" "&@REPEAT
              ("_",@CELLPOINTER("width"))}
69  dfrm      {MENU}RVmain_db~main_db~
70            {MENU}QSBDmain_db~Cmain_cr~QFEmain_en~Dmain_df~
71            QUYRMmain_ma~Amain_ab~TSQONQQ{TYPE}F
72
```

FIGURE 3

ter @DATE(89,7,27). Use the @TIME function for the time values in column G. For example, enter @TIME(4, 34,0) in cell G2.

Format the ranges as shown: Select MENU Format Currency 2 and indicate range D2..E5. Select MENU Format Date 2 and indicate range F2..F5. Select MENU Format Time 2 and indicate range G2..G5.

With the macro in Hyperspace, press the USER key (F7 on most computers) and enter *db*. The macro asks you to move the cell pointer to the upper-left corner of the database. Use the Arrow keys or press the Home key to move the cell pointer to cell A1. Then press Return. If the cell pointer is already in cell A1, press Return twice.

The macro tells you to highlight the Database range. Press the End key, the DownArrow key, the End key, and the RightArrow key to highlight the database table. Then press Return. The macro will take a minute or so to create all the ranges. Then it will switch you to the FORM window, and you're ready to go.

We won't explain how every line in the macro works, but we will detail the most complicated subroutines. If you can follow the subroutines we cover, you should be able to understand how the other subroutines work. Refer to figure 2 to see the positions of the ranges that the macro creates. Here's how the macro works.

The *db* Routine

{wdb}{PANELOFF}{WINDOWSOFF}{asf} calls the subroutine named *wbd*. The *wbd* subroutine asks you to highlight the Database range and then names that range *main_db*. The macro then freezes the screen and calls the subroutine *asf*. The *asf* subroutine assigns the cells in the first row of range *main_db* as range names for the adjacent cells in the second row of *main_db*. It also names the first row of the database *main_fir*.

{MENU}IR{DOWN 2*@COLS(main_db)+10}~{crcr}{crab} inserts rows above the *main_db* range. The macro inserts twice as many rows as there are columns in *main_db* plus 10. The macro then calls the subroutine *crcr*. The *crcr* subroutine creates the range named *main_cr* and copies the field names from the first row of *main_db* to this new range. The macro then calls the subroutine *crab*. The *crab* subroutine creates the ranges *main_ab* and *main_ma*. The subroutine then copies the field names from *main_db* to *main_ab*.

{crdf}{cren}{dfrm}{WINDOWSON}{PANELON}{ESC} calls the *crdf* subroutine. The *crdf* subroutine creates the *main_df* range and enters all the information *Symphony* requires in that range. The macro then calls the subroutine *cren*. The *cren* subroutine creates the range *main_en* and enters the field-name prompts that *Symphony*'s FORM window will use. The macro then calls the *dfrm* subroutine. The *dfrm* subroutine converts any formulas in range *main_db* to values, assigns all the basic query settings, and switches to the FORM environment. The macro then turns the screen display back on and refreshes the display.

The *crcr*, *cop*, and *cop2* Routines

{GOTO}main_db~{UP 5} moves the cell pointer to five rows above the upper-left corner of range *main_db*.

{MENU}RNCmain_cr~{BS}.{RIGHT @COLS(main_db)−1}{DOWN}~ creates the range *main_cr*. Here the macro uses the {BACKSPACE} command and the period to anchor at the current cell the highlight produced by the Range Name Create command. The macro then moves the highlight to the right to encompass all the columns in range *main_db*. It includes a second row in the range with the {DOWN} command.

OUR MACRO CREATES AND NAMES RANGES, FILLS IN LABELS, AND RE-CREATES ANY FORMULAS IT FINDS IN THE ORIGINAL TABLE.

{cop "main_cr"}{DOWN}{MENU}FOL{RIGHT @COLS(main_db)−1}~ calls the subroutine *cop*, using "main_cr" as an argument.

The *cop* subroutine uses the *cop2* subroutine to copy the field names from the first row of *main_db* to the first row of the range specified in the argument of the call. Here's how the *cop* subroutine works.

{DEFINE temp} enters the argument from the parent routine's call in the cell named *temp*. For example, when the *crcr* subroutine calls the *cop* subroutine, the macro enters *main_cr* in *temp*.

{RECALC cop2}{FOR ct,0,@COLS(main_db)−1,1,cop2}~ recalculates the string formula in the cell named *cop2*. The macro then starts a FOR loop that runs the *cop2* subroutine one time for each of the columns in *main_db*. The {FOR} command has the syntax {FOR *counter_location,start_number,stop_number,step_number,starting_location*}. The cell named *ct* is where the FOR loop keeps track of how many times it has run the *cop2* subroutine. Starting with zero, the FOR loop increases the count in *ct* by one each time that it calls *cop2*. It continues calling *cop2* until the value in *ct* exceeds the value indicated by the stop number. In our example, the macro stops looping after the FOR loop calls *cop2* seven times, since the result of the stop-number formula, @COLS(main_db)−1, is 6. After running the FOR loop, the macro presses the Return key.

The string formula in *cop2* takes the label stored in *temp* and uses it as the first argument in a {PUT} command. For example, if *temp* contains the label *main_cr*, the formula in *cop2* returns the label *{PUT main_cr,ct,0,@INDEX(main_db,ct,0)}*. In this case, the macro copies the label from the first row of *main_db* that has an offset equal to the value in *ct* to the cell in the first row of *main_cr* that has the same offset.

The *crdf* Routine

{GOTO}main_ab~{UP @COLS(main_db)+1} moves the cell pointer to the upper-left corner of range *main_ab*. The macro then moves the cell pointer up one more row than the number of columns in range *main_db*.

{MENU}RNCmain_df~{BS}.{DOWN @COLS (main_db)−1} starts creating a range named *main_df* that is as deep as the *main_db* range is wide.

{RIGHT @MAX(7,@COLS(main_db)−1)}~{UP} Name {RIGHT}Value{RIGHT} finishes creating the *main_df* range that is as wide as the *main_db* range, or seven-columns wide if *main_db* has fewer than seven columns. The macro then enters *Name* over the first column of range *main_df* and *Value* over the second column.

Type{RIGHT}Default{RIGHT}Formula{RIGHT}Validity {RIGHT}Input continues entering identification labels over the columns in range *main_df*.

{RIGHT}Prompt~{GOTO}main_df~{cop "main_df"} {MENU}RT finishes entering labels over the columns in range *main_df*. The macro then moves the cell pointer to the upper-left corner of *main_df* and uses the *cop* subroutine to copy the field names from the database. The macro then issues a Range Transpose command.

{RIGHT @COLS(main_db)−1}~~{RIGHT}{MENU} Cmain_fir~~ highlights the field names that the macro previously copied and specifies the current cell as the target for the Range Transpose command. *Symphony* transposes the field names so that they fill the range of cells below and including the current cell. The macro then moves the cell pointer to the right and copies the cells from range *main_fir* to the current cell. The range *main_fir* contains the first record in the database.

{FOR ct,1,@COLS(main_db)−1,1,trns} runs the subroutine *trns* one time fewer than there are columns in range *main_db*. The subroutine *trns* moves the cell pointer to the right. It then moves the contents of that cell down as many rows as the value in *ct* and to the left as many columns as the value in *ct*. Thus the FOR loop performs similarly to a Range Transpose command, with one important difference. Unlike the Range Transpose command, the macro retains the relationships contained in any formulas. So if the fifth field contains a formula that refers to the second and fourth fields, that formula will still refer to those fields after the macro transposes the fields from a horizontal to a vertical orientation.

{GOTO}main_db~{DOWN}{FOR ct,0,@COLS (main_db)−1,1,fild} moves the cell pointer to one cell down from the upper-left corner of *main_db*. The macro then runs the *fild* subroutine (explained below) as many times as there are columns in range *main_db*.

{GOTO}main_df~{RIGHT 7}+"Enter "& {LEFT 7}~ moves the cell pointer to the column in *main_df* below the label *Prompt*. The macro then creates a string formula that concatenates the string *Enter* with the field name in the first column of the current row of *main_df*.

{MENU}C~{DOWN}.{DOWN @COLS(main_db)−2} ~{MENU}RV copies the string formula in the current cell down as many field names as there are in the database. The macro then issues a Range Values command.

{DOWN @COLS(main_db)−1}~~{GOTO}main_df~ {RIGHT 2} highlights the range of string formulas in the current column to complete the Range Values command. The macro then moves the cell pointer two cells to the right of the upper-left corner of range *main_df*. This puts the cell pointer on the cell directly below the label *Type*.

{FOR ct,1,@COLS(main_db),1,frm} runs the subroutine *frm* (see below) as many times as there are columns in range *main_db*. The *frm* subroutine enters the appropriate formula in the formula column of *main_df* if the current cell indicates that the field type is Calculated.

The *frm* and *long* Routines

{IF @LEFT(@CELLPOINTER("contents"),1)="C"} {long} calls the subroutine *long* if the current cell begins with a C. The *long* subroutine moves the cell pointer to the left and then moves the formula in that cell three columns to the right. The subroutine then copies the formula that it just moved back to the cell where it originated. Now the formula is in the *Formula* column of the *main_df* range, where *Symphony* can find it. By copying the formula back to the *Value* column, the macro copies the format of the cell. *Symphony* uses the formats of the cells in the *Value* column as formats for the database fields in the FORM window.

{DOWN} moves the cell pointer down one row.

The *fild* Routine

{IF ct}{RIGHT} moves the cell pointer to the right if the cell named *ct* contains a value other than zero. So on the first iteration of the FOR loop in the *crdf* subroutine (cell B37), the cell pointer stays where it is. In subsequent iterations, the macro moves the cell pointer to the right.

{LET temp,@UPPER(@CELLPOINTER("type"))} enters the current cell's type in the cell named *temp*. If the current cell contains a label, the macro enters an L in *temp*. If the cell contains a value or a formula, the macro enters a V in *temp*.

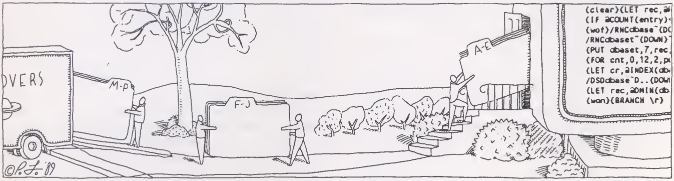
{IF temp="V"}{dtrm} calls the subroutine *dtrm* if *temp* contains the letter V. The *dtrm* subroutine determines whether the field for the current cell should be a date field, a time field, a calculated field, or a number field. The subroutine then enters a D, T, C, or N in *temp* to indicate which field type applies to the current cell. Note that the macro does not correct for blank entries in the first record of the database. All fields in the first record of the database must contain either a label, a value, or a formula for the macro to work properly.

{PUT main_df,2,ct,temp&":"&@STRING(@CELLPOINTER("width"),0)} enters the field type and width in the cell in the second column of *main_df* that is as many rows below the top row of that range as the value in *ct*. The macro concatenates the label in *temp* with a colon followed by the number that corresponds to the width of the current cell. ■

1-2-3 CARD FILE

Like a Rolodex, this macro-driven template helps you keep track of your friends and associates.

BY DANIEL GASTEIGER

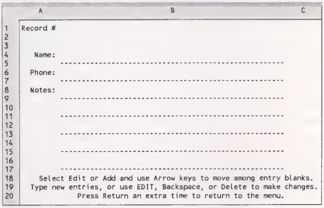


PAUL FISCH

No matter how much information you store on your computer, you probably still keep phone numbers on a Rolodex. After all, you can quickly find any name when it's tucked into the appropriate slot. And each card in the file can contain phone numbers, addresses, and other useful information.

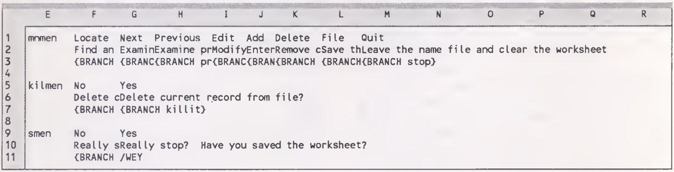
The instructions in the box on page 45 will help you create an electronic card file that works in *1-2-3* Releases 2.01, 2.2, and 3. Once you've created the model, save the worksheet under the file name CARDFILE. Then run the macro it contains by holding down the MACRO key (Alt on most computers) and pressing R. Because the macro is also named \0, it will automatically run when you retrieve the file in the future.

On-screen menus and prompts will guide you in your use of the card-file template, but there are a few points you should know before you start. The macro automatically places new records into position alphabetically by name. For this reason, it's sensible to enter last names first, as in *Lubidnick, Colleen*. If you choose to enter first



```
        A                          B                                C
 1  Record #
 2
 3
 4     Name:
 5           ---------------------------------------------
 6    Phone:
 7           ---------------------------------------------
 8    Notes:
 9           ---------------------------------------------
10
11           ---------------------------------------------
12
13           ---------------------------------------------
14
15           ---------------------------------------------
16
17           ---------------------------------------------
18     Select Edit or Add and use Arrow keys to move among entry blanks.
19   Type new entries, or use EDIT, Backspace, or Delete to make changes.
20           Press Return an extra time to return to the menu.
```

FIGURE 1

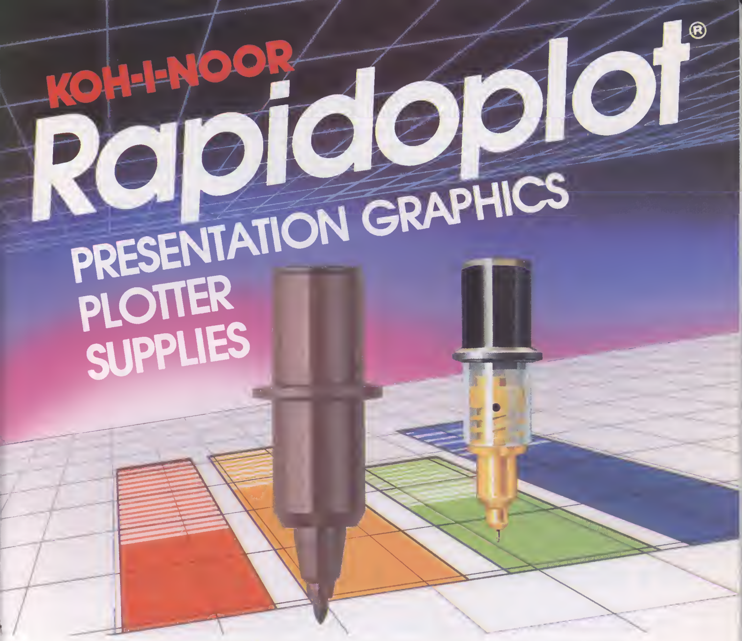


```
     E       F    G    H     I   J   K    L    M    N    O    P    Q    R

1  mnmen   Locate Next Previous Edit Add Delete File  Quit
2          Find an ExaminExamine prModifyEnterRemove cSave thLeave the name file and clear the worksheet
3          {BRANCH {BRANC{BRANCH pr{BRANC{BRAN{BRANCH {BRANCH{BRANCH stop}
4
5  kilmen  No     Yes
6          Delete cDelete current record from file?
7          {BRANCH {BRANCH killit}
8
9  smen    No     Yes
10         Really sReally stop?  Have you saved the worksheet?
11         {BRANCH /WEY
```

FIGURE 2

CIRCLE 125 ON READER SERVICE CARD ⟶



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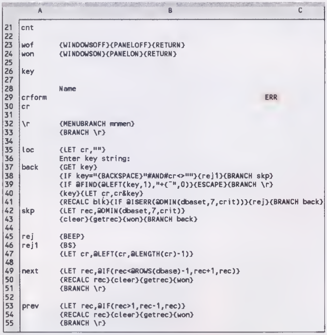
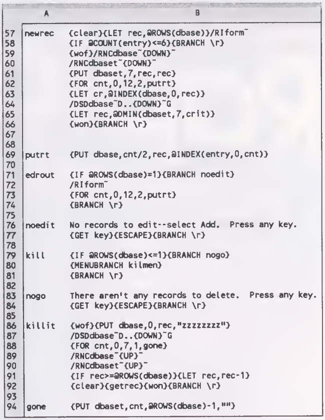
names first, you'll still be able to find records easily, but the alphabetization will be by first name. When you enter a phone number, be sure to precede it with a label prefix. Also, the rows that hold notes can contain a maximum of 53 characters per row.

When you select Edit or Add, the macro activates



```
          A                        B                                    C
21  cnt
22
23  wof       {WINDOWSOFF}{PANELOFF}{RETURN}
24  won       {WINDOWSON}{PANELON}{RETURN}
25
26  key
27
28            Name
29  crform                                                           ERR
30  cr
31
32  \r        {MENUBRANCH mnmen}
33            {BRANCH \r}
34
35  loc       {LET cr,""}
36            Enter key string:
37  back      {GET key}
38            {IF key="{BACKSPACE}"#AND#cr<>""}{rej1}{BRANCH skp}
39            {IF @FIND(@LEFT(key,1),"+{~",0)}{ESCAPE}{BRANCH \r}
40            {key}{LET cr,cr&key}
41            {RECALC blk}{IF @ISERR(@DMIN(dbaset,7,crit))}{rej}{BRANCH back}
42  skp       {LET rec,@DMIN(dbaset,7,crit)}
43            {clear}{getrec}{won}{BRANCH back}
44
45  rej       {BEEP}
46  rej1      {BS}
47            {LET cr,@LEFT(cr,@LENGTH(cr)-1)}
48
49  next      {LET rec,@IF(rec<@ROWS(dbase)-1,rec+1,rec)}
50            {RECALC rec}{clear}{getrec}{won}
51            {BRANCH \r}
52
53  prev      {LET rec,@IF(rec>1,rec-1,rec)}
54            {RECALC rec}{clear}{getrec}{won}
55            {BRANCH \r}
```

FIGURE 3



```
          A                        B
57  newrec    {clear}{LET rec,@ROWS(dbase)}/RIform~
58            {IF @COUNT(entry)<=6}{BRANCH \r}
59            {wof}/RNCdbase~{DOWN}~
60            /RNCdbaset~{DOWN}~
61            {PUT dbaset,7,rec,rec}
62            {FOR cnt,0,12,2,putrt}
63            {LET cr,@INDEX(dbase,0,rec)}
64            /DSDdbase~D..{DOWN}~G
65            {LET rec,@DMIN(dbaset,7,crit)}
66            {won}{BRANCH \r}
67
68
69  putrt     {PUT dbase,cnt/2,rec,@INDEX(entry,0,cnt)}
70
71  edrout    {IF @ROWS(dbase)=1}{BRANCH noedit}
72            /RIform~
73            {FOR cnt,0,12,2,putrt}
74            {BRANCH \r}
75
76  noedit    No records to edit--select Add.  Press any key.
77            {GET key}{ESCAPE}{BRANCH \r}
78
79  kill      {IF @ROWS(dbase)<=1}{BRANCH nogo}
80            {MENUBRANCH kilmen}
81            {BRANCH \r}
82
83  nogo      There aren't any records to delete.  Press any key.
84            {GET key}{ESCAPE}{BRANCH \r}
85
86  killit    {wof}{PUT dbase,0,rec,"zzzzzzzz"}
87            /DSDdbase~D..{DOWN}~G
88            {FOR cnt,0,7,1,gone}
89            /RNCdbase~{UP}~
90            /RNCdbaset~{UP}~
91            {IF rec>=@ROWS(dbase)}{LET rec,rec-1}
92            {clear}{getrec}{won}{BRANCH \r}
93
94  gone      {PUT dbaset,cnt,@ROWS(dbase)-1,""}
```

FIGURE 4

continued on next page

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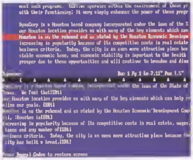

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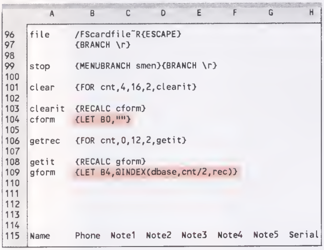
CIRCLE 114 ON READER SERVICE CARD

1-2-3's Range Input command. You can move the cell pointer only to the unprotected cells in range B4..B17 of figure 1. The Range Input mode allows the same type of cell entries as the Ready mode. Edit an existing entry by moving the cell pointer to it and pressing the EDIT key. To erase any line of a record, type an apostrophe label prefix and press Return. To delete an entire record, return to the main menu of the macro and select Delete.

To locate a card, select Locate from the menu. Then start typing characters from the name you wish to locate. For example, to find Colleen Lubidnick's record, select Locate, then type *L*. If her record is the only one that contains a capital L, it appears immediately. Press Return and the macro will redisplay the main menu.

If there is more than one record that contains a capital L, you'll see the first of such records. For example, the record for Anderholm, Larry might appear when you type the letter *L*. Type the next letter in the name you wish to retrieve. In this case, you'd type *u*.

If Colleen's is the only record containing the character string *Lu*, her record appears. But if there is a Feinstein, Lucinda in your card file, that record appears. Type a *b*, and Colleen's record may appear. In any case, type only as many letters as needed to identify the record you wish to retrieve. After you find and use the desired record, press Return to redisplay the main menu. ■



```
        A        B        C       D       E       F       G       H
96   file     /FScardfile~R{ESCAPE}
97            {BRANCH \r}
98
99   stop     {MENUBRANCH smen}{BRANCH \r}
100
101  clear    {FOR cnt,4,16,2,clearit}
102
103  clearit  {RECALC cform}
104  cform    {LET B0,""}
105
106  getrec   {FOR cnt,0,12,2,getit}
107
108  getit    {RECALC gform}
109  gform    {LET B4,@INDEX(dbase,cnt/2,rec)}
110
111
112
113
114
115  Name     Phone   Note1   Note2   Note3   Note4   Note5   Serial
```

FIGURE 5

Daniel Gasteiger is a 1-2-3 *and* Symphony *consultant and a contributing editor to* LOTUS.

HOW TO BUILD THE CARD-FILE MODEL

1. Column widths

Set the width of column B to 53: Move the cell pointer to column B, select /Worksheet Column Set-Width, and enter 53. (Note that we've adjusted column widths in some illustrations to conserve space in the magazine. The only width you need to adjust is that of column B.)

2. Labels

Enter labels as shown in the five figures, but omit any labels shown in red. Remember to begin any entry that starts with a slash (/) or a backslash (\) with an apostrophe label prefix. To create the long underlines in range B5..B17, enter a backslash and a hyphen (\-) in cell B5. Then select /Copy and specify range B5..B16 as the From range and cell B7 as the To range. To right-align the labels in range A4..A8, select /Range Label Right and specify range A4..A8. Precede the entry in cell A18 with 4 space characters, the entry in cell A19 with 2 space characters, and the entry in cell A20 with 13 space characters. Finally, the following list shows the full text for the cells in range F2..M11:

Cell	Label
F2	Find an entry in the card file
G2	Examine next entry
H2	Examine previous entry
I2	Modify current record
J2	Enter a new record
K2	Remove current record from file
L2	Save the worksheet
M2	Leave the name file and clear the worksheet
F3	{BRANCH loc}
G3	{BRANCH next}
H3	{BRANCH prev}
I3	{BRANCH edrout}
J3	{BRANCH newrec}
K3	{BRANCH kill}
L3	{BRANCH file}
M3	{BRANCH stop}
F6	Delete current record from file?
G6	Delete current record from file?
F7	{BRANCH \r}
G7	{BRANCH killit}
F10	Really stop? Have you saved the worksheet?
G10	Really stop? Have you saved the worksheet?
F11	{BRANCH \r}
G11	/WEY

3. Range protection

Unprotect cells B4, B6, B8, B10, B12, B14, and B16. For example, to unprotect cell B4, select /Range Unprotect, and indicate cell B4.

4. Range names

Assign the labels in range A21..A109 as names for the adjacent cells of column B. Assign the labels in range E1..E9 as names for the adjacent cells of column F. For example, to assign the column B range names, select /Range Name Labels Right and indicate range A21..A109.

Assign the following additional range names:

Name	Range
blk	B28..B30
crit	B28..B29
dbase	A115..G115
dbaset	A115..H115
entry	B4..B16
form	A1..B17
rec	A2
\0	B32

For example, to assign the name *blk*, select /Range Name Create, enter *blk*, then indicate range B28..B30.

5. Formulas

Enter formulas in the cells indicated:

Cell	Formula
B29	@FIND($cr,A116,0)+1
B104	+"{LET B"&@STRING(cnt,0)&",""""}"
B109	+"{LET B"&@STRING(cnt+4,0)&", @INDEX(dbase,cnt/2,rec)}"

6. Final preparation

Select /Data Sort Primary-Key, indicate cell A116, enter A for ascending sort order, and select Quit. Move the cell pointer to cell A2, select /File Save, and enter the file name CARDFILE. When you retrieve the file in the future, the macro will start automatically.

Making the Best Use of Resources

Use this linear programming worksheet to find the most sensible product mix.

BY KEN SAUL

Linear programming is a mathematical method of solving practical problems involving the optimal use of limited resources. It's not computer programming. The term *programming* here means that the problem must be solved in several steps. The term *linear* means that the first step in solving a real-world problem is to express it in linear equations, that is, in equations that do not use exponents.

You can create a worksheet for *1-2-3* or *Symphony* that applies linear programming to business problems where you need to maximize some value. This model helps maximize profits by finding the optimal numbers of various goods to produce with the materials you have on hand. It runs in *1-2-3* Releases 2.01, 2.2, and 3 and *Symphony* Release 2.0. The worksheet uses 53 lines of macro code and just a few formulas.

We'll create an example that illustrates how you can use this technique in your own optimization problems. The Jordan Snack company makes two kinds of nut mixtures: regular and fancy. They both contain peanuts, almonds, filberts, and cashews. Both are sold in 12-ounce cans. But, as you see below, the proportions are different:

	Regular	Fancy
Peanuts	6 Ounces	2 Ounces
Almonds	2	3
Filberts	2	3
Cashews	2	4

As you'd expect, the fancy mixture is sold at a higher price and gives a higher per-can profit. Specifically, the profit is $1.03 on a can of fancy mixture and 81 cents on a can of regular mixture.

Furthermore, Jordan currently has the following amounts of each kind of nut on hand in its storeroom:

Peanuts	5,000 Ounces
Almonds	2,000
Filberts	2,100
Cashews	5,400

Naturally, Jordan would like to maximize its profits. Making as many cans of the higher-priced mixture as possible is not the way to do so. Since there are 3 ounces of almonds in a can of fancy mixed nuts and only 2,000 ounces of almonds available, Jordan could make only 666 cans of fancy mixture. This would leave 3,668 ounces of peanuts, 2 ounces of almonds, 102 ounces of filberts, and 1,836 ounces of cashews. There are enough almonds left to make one additional can of regular mixture. The profit from 666 cans of fancy and one can of regular is $686.79.

But with over 3,000 ounces of peanuts left over, it seems likely that Jordan could do better by making fewer cans of fancy and using the stock to make cans of regular. For example, making two fewer cans of fancy frees up enough stock to make three more cans of regular, and the profit increases to $687.16. Could it be that Jordan should make as many cans of regular as possible? That combination would be 833 cans of regular and 1 can of fancy for a profit of $675.76.

Obviously, there's an optimal combination of the two mixtures. Using a linear programming technique known as the simplex algorithm, you can zero in on the correct combination. We won't go into the theories of linear programming and the simplex algorithm here. You can learn more about them from textbooks dealing with linear programming or with the broader topic of modeling and simulation. What we will discuss, using the Jordan Snack problem as an example, is how to adapt your own optimization problems to the worksheet that accompanies this article.

Ken Saul is a manufacturing engineer with Hewlett-Packard Co.

DEFINING THE PROBLEM

The first step is to express your problem in simple linear formulas. Given the mixtures and amounts on hand that were discussed earlier, the combination of regular and fancy cans that gives the greatest profit corresponds to the highest values of R and F that satisfy all of the following inequalities:

Peanuts $6R + 2F = 5{,}000$
Almonds $2R + 3F = 2{,}000$
Filberts $2R + 3F = 2{,}100$
Cashews $2R + 4F = 5{,}400$

Next, change the formulas from inequalities to equalities by introducing so-called slack variables, as shown below:

Peanuts $6R + 2F + \text{SLACKp} = 5{,}000$
Almonds $2R + 3F + \text{SLACKa} = 2{,}000$
Filberts $2R + 3F + \text{SLACKf} = 2{,}100$
Cashews $2R + 4F + \text{SLACKc} = 5{,}400$

The slack variables represent the less-than portion of the inequalities. When the analysis is complete, check the slack variables to see how much stock is left.

We also need a formula for the maximum profit:

GREG RAGLAND

$$0.81R + 1.03F = \text{maximum}$$

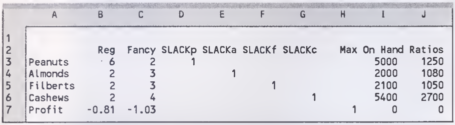
This formula is already an equality. However, we must move the term *maximum* to the left side and make it positive. First change the formula to:

$$0.81R + 1.03F - \text{maximum} = 0$$

Then multiply all its terms by -1 to get:

$$-0.81R - 1.03F + \text{maximum} = 0$$

Having expressed the problem in terms of these five formulas—four for mixtures and one for profit—we now convert the formulas into a table in the linear-programming worksheet. Look at figure 1. Row 3 of the worksheet is used for peanuts. There is a 6 in the *Reg* column and a 2 in the *Fancy* column because the regular mixture has 6 ounces of peanuts and the fancy mixture has 2 ounces of peanuts. There is a 1 in the *SLACKp* column because we use the variable *SLACKp* in the peanuts formula. The other *SLACK* columns are left empty in this row. Finally, 5000 appears in the *On Hand* column. Thus, the formula 6R + 2F + SLACKp = 5,000 becomes 6 in the *Reg* column, 2 in the *Fancy* column, 1 in the *SLACKp* column, and 5000 in the *On Hand* column.



	A	B	C	D	E	F	G	H	I	J
1										
2		Reg	Fancy	SLACKp	SLACKa	SLACKf	SLACKc	Max	On Hand	Ratios
3	Peanuts	6	2	1					5000	1250
4	Almonds	2	3		1				2000	1080
5	Filberts	2	3			1			2100	1050
6	Cashews	2	4				1		5400	2700
7	Profit	-0.81	-1.03					1	0	0

FIGURE 1. The formulas detailed in the text for maximizing profit in the Jordan Snack scenario are converted to entries in this table. For example, the formula for peanuts, 6R + 2F + SLACKp = 5,000, is represented by the 6 in the *Reg* column, the 2 in the *Fancy* column, the 1 in the *SLACKp* column, and the 5000 in the *On Hand* column. The values initially returned by the ratio formulas in column J are not important. These formulas are used by the worksheet's macros.

The next row is used for almonds, where the formula 2R + 3F + SLACKa = 2,000 becomes 2 in the *Reg* column, 3 in the *Fancy* column, 1 in the *SLACKa* column, and 2000 in the *On Hand* column. The formulas for filberts and cashews are converted to entries in this table in the same manner.

Row 7 of the worksheet is used for the profit formula. The formula $-0.81F - 1.03R + \text{maximum} = 0$ becomes -0.81 in the *Reg* column, -1.03 in the *Fancy* column, 1 in the *Max* column, and 0 in the *On Hand* column.

Column J of the worksheet contains the ratio formulas. The results of these are not important in themselves, but the worksheet's macros use them as they apply the simplex algorithm to the problem.

THE SIMPLEX-ALGORITHM MACRO

Set up the worksheet as described in the box on page 51. Be sure to save the worksheet before trying the macro. Then hold down the MACRO key (Alt on most computers) and press S to find the correct answer to the mixed-nuts problem.

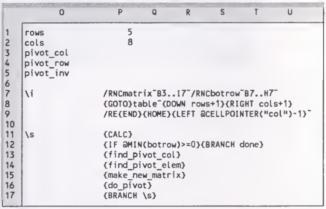
The \s macro, shown in figure 2, starts by calculating the worksheet. Then it checks to see if the lowest amount in the bottom row of the table (with the exception of the rightmost value) is greater than or equal to 0. When this condition is met, the macro invokes the *done* routine, shown in figure 4. Because this condition is probably not met on the first pass through the macro, we won't look at the *done* routine right away.

The next four instructions in the \s macro are the names of subroutines. That is, the \s macro passes control first to the *find_pivot_col* routine. Once that routine is finished, \s resumes, passing control to *find_pivot_elem*, and so forth. The four subroutines shown in figure 3 work through the steps of the simplex algorithm.

Once all four subroutines have been called, the \s macro is restarted. This loop continues until the condition in the macro's second line is met. Then the macro branches to the *done* routine, which simply replaces all the 0s in the last matrix with label prefixes so that the cells appear blank. Finally, two beeps are sounded to let you know the program is complete.

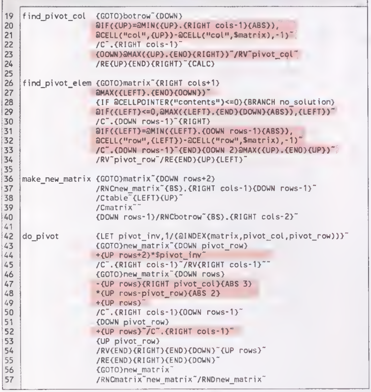
INTERPRETING THE RESULTS

If you've set up the worksheet correctly and run the macro, the values in your worksheet will match those in figure 5. The last matrix, in range B17..I21, guides you to the correct amounts of regular and fancy nut mixtures to make. Notice that the columns headed *Reg* and *Fancy* in this range each contain a 1; the rest of the cells in these columns appear blank. Find the 1 in the *Reg* column,



```
        O                P         Q        R        S        T        U
 1  rows                 5
 2  cols                 8
 3  pivot_col
 4  pivot_row
 5  pivot_inv
 6
 7  \i          /RNCmatrix~B3..I7~/RNCbotrow~B7..H7~
 8              {GOTO}table~{DOWN rows+1}{RIGHT cols+1}
 9              /RE{END}{HOME}{LEFT @CELLPOINTER("col")-1}~
10
11  \s          {CALC}
12              {IF @MIN(botrow)>=0}{BRANCH done}
13              {find_pivot_col}
14              {find_pivot_elem}
15              {make_new_matrix}
16              {do_pivot}
17              {BRANCH \s}
```

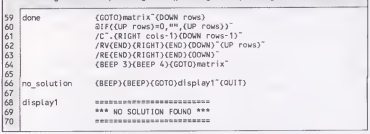
FIGURE 2. Range P1..P5 is used for values required by the macros. The \i macro, starting in cell P7, initializes the worksheet by setting the ranges *matrix* and *botrow* to their original coordinates and then erasing the additional tables of numbers the \s macro creates. The \s macro, starting in cell P11, calculates the worksheet and executes a branch to the *done* routine if the simplex algorithm is finished. Otherwise, it calls four subroutines that perform the steps of the simplex algorithm.



```
            O                P      Q      R      S      T      U      V      W

19 find_pivot_col  {GOTO}botrow~{DOWN}
20                 @IF({UP}=@MIN({UP}.{RIGHT cols-1}{ABS}),
21                 @CELL("col",{UP})-@CELL("col",$matrix),-1)~
22                 /C~.{RIGHT cols-1}~
23                 {DOWN}@MAX({UP}.{END}{RIGHT})~/RV~pivot_col~
24                 /RE{UP}{END}{RIGHT}~{CALC}
25
26 find_pivot_elem {GOTO}matrix~{RIGHT cols+1}
27                 @MAX({LEFT}.{END}{DOWN})~
28                 {IF @CELLPOINTER("contents")<=0}{BRANCH no_solution}
29                 @IF({LEFT}<=0,@MAX({LEFT}.{END}{DOWN}{ABS}),{LEFT})~
30                 /C~.{DOWN rows-1}~{RIGHT}
31                 @IF({LEFT}=@MIN({LEFT}.{DOWN rows-1}{ABS}),
32                 @CELL("row",{LEFT})-@CELL("row",$matrix),-1)~
33                 /C~.{DOWN rows-1}~{END}{DOWN 2}@MAX({UP}.{END}{UP})~
34                 /RV~pivot_row~/RE{END}{UP}{LEFT}~
35
36 make_new_matrix {GOTO}matrix~{DOWN rows+2}
37                 /RNCnew_matrix~{BS}.{RIGHT cols-1}{DOWN rows-1}~
38                 /Ctable~{LEFT}{UP}~
39                 /Cmatrix~~
40                 {DOWN rows-1}/RNCbotrow~{BS}.{RIGHT cols-2}~
41
42 do_pivot        {LET pivot_inv,1/(@INDEX(matrix,pivot_col,pivot_row))}~
43                 {GOTO}new_matrix~{DOWN pivot_row}
44                 +{UP rows+2}*$pivot_inv~
45                 /C~.{RIGHT cols-1}~/RV{RIGHT cols-1}~~
46                 {GOTO}new_matrix~{DOWN rows}
47                 -{UP rows}{RIGHT pivot_col}{ABS 3}
48                 *{UP rows-pivot_row}{ABS 2}
49                 +{UP rows}~
50                 /C~.{RIGHT cols-1}{DOWN rows-1}~
51                 {DOWN pivot_row}
52                 +{UP rows}~/C~.{RIGHT cols-1}~
53                 {UP pivot_row}
54                 /RV{END}{RIGHT}{END}{DOWN}~{UP rows}~
55                 /RE{END}{RIGHT}{END}{DOWN}~
56                 {GOTO}new_matrix~
57                 /RNCmatrix~new_matrix~/RNDnew_matrix~
```

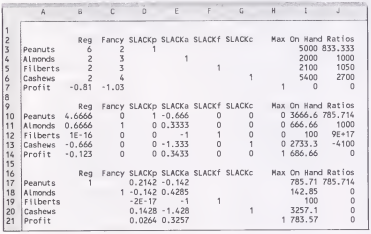
FIGURE 3. These four subroutines perform the steps required for finding an optimal product mix via the simplex algorithm. The shaded cells contain macro instructions that instruct *1-2-3* or *Symphony* to create formulas using Arrow keys to specify which cells or ranges will be used as values.



```
            O                P      Q      R      S      T      U      V      W

59 done            {GOTO}matrix~{DOWN rows}
60                 @IF({UP rows}=0,"",{UP rows})~
61                 /C~.{RIGHT cols-1}{DOWN rows-1}~
62                 /RV{END}{RIGHT}{END}{DOWN}~{UP rows}~
63                 /RE{END}{RIGHT}{END}{DOWN}~
64                 {BEEP 3}{BEEP 4}{GOTO}matrix~
65
66 no_solution     {BEEP}{BEEP}{GOTO}display1~{QUIT}
67
68 display1        ========================
69                 *** NO SOLUTION FOUND ***
70                 ========================
```

FIGURE 4. This screen shows the *done* and *no_solution* routines and the message that is displayed if the simplex algorithm can't find a solution.



```
        A         B      C      D      E      F      G      H      I      J

1
2               Reg  Fancy SLACKp SLACKa SLACKf SLACKc    Max On Hand Ratios
3  Peanuts        6      2      1                               5000 833.333
4  Almonds        2      3             1                        2000    1000
5  Filberts       2      3                    1                 2100    1050
6  Cashews        2      4                           1          5400    2700
7  Profit     -0.81  -1.03                                   1     0       0
8
9               Reg  Fancy SLACKp SLACKa SLACKf SLACKc    Max On Hand Ratios
10 Peanuts   4.6666      0      1 -0.666      0      0      0 3666.6 785.714
11 Almonds   0.6666      1      0 0.3333      0      0      0 666.66    1000
12 Filberts   1E-16      0      0     -1      1      0      0    100   9E+17
13 Cashews   -0.666      0      0 -1.333      0      1      0 2733.3   -4100
14 Profit    -0.123      0      0 0.3433      0      0      1 686.66       0
15
16              Reg  Fancy SLACKp SLACKa SLACKf SLACKc    Max On Hand Ratios
17 Peanuts        1        0.2142 -0.142                        785.71 785.714
18 Almonds               1 -0.142 0.4285                        142.85       0
19 Filberts                -2E-17     -1      1                    100       0
20 Cashews                 0.1428 -1.428             1          3257.1       0
21 Profit                  0.0264 0.3257                     1  783.57       0
```

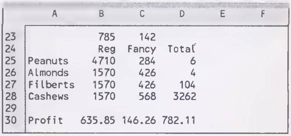
which is in cell B17, then find the value in the *On Hand* column that's in the same row. In this case, that value is 785.71.

To find out how many cans of fancy mixture to make, look for the 1 in the *Fancy* column, then find the value from the same row of the *On Hand* column. That value is 142.85. Naturally, Jordan can't make partial cans of mixed nuts. For the moment, we'll consider 785 cans of regular and 142 cans of fancy to be the correct solution.

The *SLACKp* and *SLACKa* columns have some low numbers in them rather than the combination of blanks and a single 1. This indicates that few peanuts and almonds are left over. The *SLACKf* and *SLACKc* columns each display a 1. The 1s direct you to values in the *On Hand* column that indicate there are 100 ounces of filberts (cell I19) and 3,257.1 ounces of cashews left (cell I20). The maximum profit, $783.57, appears in cell I21.

Let's construct a simple table to verify all this. First copy range A17..A20 to cell A25 and copy range B16..C16 to cell B24. Enter the word *Profit* in cell A30 and the label *"Total* in cell D24. Enter *785* and *142* in cells B23 and C23, respectively. Enter the formula +B$23*B3 in cell B25 and copy cell B25 to range B25..C28. These formulas indicate how many ounces of each kind of nut is required to make 785 cans of regular mixture and 142 cans of fancy mixture.

Enter the formula −B7*B23 in cell B30 and copy this formula to cell C30. These formulas indicate the profit to be made from selling 785 cans of regular mixture and 142 cans of fancy mixture. Enter the formula +I3−@SUM(B25..C25) in cell D25



```
         A          B       C       D       E       F

23                785     142
24                Reg   Fancy   Total
25 Peanuts       4710     284       6
26 Almonds       1570     426       4
27 Filberts      1570     426     104
28 Cashews       1570     568    3262
29
30 Profit      635.85  146.26  782.11
```

and copy this formula to range D26..D28. These formulas indicate the amounts left over. Finally, enter the formula +B30+C30 in cell D30 to compute total profit. This area of your worksheet should now resemble the screen above.

FIGURE 5. This is the way the screen looks after using the \s macro to solve the original Jordan Snacks mixed-nuts problem. In the third table, there is a 1 in worksheet row 17 under the column heading *Reg*. The value in the *On Hand* column in row 17 tells you the number of cans of regular mixture to make: 785. The 1 in the *Fancy* column is in worksheet row 18, so the value in the *On Hand* column in row 18 tells you the number of cans of fancy mixture to make: 142. The value in row 21 of the *On Hand* column indicates that the profit for this combination is $783.57.

In a situation where the simplex algorithm gives you fractional answers, it's reasonable to simply drop the fraction. Another approach would be to vary the combination a few times and see if you can find a slightly better solution.

As you can see, the combination of 785 and 142 leaves enough stock to make one more can of either mixture. It makes sense to make an additional can of the mixture with the higher profit, so replace the entry in cell C23 with 143 and press CALC. The profit for this combination is $783.14. But a little more trial and error would show you that the very best combination is 784 cans of regular mixture and 144 cans of fancy mixture, which gives a profit of $783.36. To see this, enter *784* and *144* in cells B23 and C23 and press CALC.

The simplex algorithm has calculated the answer that's mathematically correct (785.71 cans of regular, 142.85 cans of fancy) but not the one that allows for the realities of manufacturing. Still, the 784/144 combination is only $1.25 better than the 785/142 combination and 22 cents better than the 785/143 combination. Certainly, Jordan wouldn't go broke using any of these combinations.

If you're not convinced that the macro got very close to the best combination, try increasing either of the amounts in cells B23 or C23 and pressing CALC. One or more of the values in range D25..D28 becomes negative, indicating an impossible combination. If you decrease the other value, you can get all the leftover formulas to return zeros or positive numbers again. But the total profit in cell D30 will be less than the $783.36 you get with 784 cans of regular mix and 144 cans of fancy mix.

Now let's see how to use the simplex-algorithm macro as a way to test hypotheses. For example, the solution above showed that Jordan is limited by the quantity of peanuts and almonds. If the company could arrange to obtain 10 more pounds (160 ounces) of almonds, how would the mix and profit change? This type of what-if testing is called marginal analysis because it shows the sensitivity of profit margin to a small change in input variables.

First, initialize the worksheet by pressing MACRO-I. This resets the range names *matrix* and *botrow* to their original coordinates and erases the additional matrices created by the macro. Replace the entry in cell I4 with 2160. Then press MACRO-S to solve the new matrix. The new profit is about $816, when you fill 771 cans of regular and 185 cans of fancy. Jordan makes about $33 in additional profit by adding 160 ounces of almonds to its supplies. If the cost to add this amount of almonds is significantly less than $33, the expenditure's worthwhile.

ADAPTING THE WORKSHEET

The worksheet is initially set up for two possible products, each of which contains up to four components. To use the model in other settings with the same number of variables, you need only change some labels and enter the appropriate values. For example, an electronics firm might use the worksheet to decide how many radios and stereo tape players to produce, given limited supplies of tuners, amplifier boards, tape drives, and speakers.

You can change the number of different materials or the number of formulas for mixing materials almost as easily. Suppose that Jordan Snacks also uses sunflower seeds in its regular mixture and that it has 2,000 ounces of these on hand. We now need a new formula:

2R + 0F + SLACKs = 2,000

First press MACRO-I to initialize the worksheet. Then create space for a new row in the table: Press / (in *Symphony*, MENU), select Move, specify A7..J7 as the From range, and specify cell A8 as the To range. It's important that you use the Move command instead of the Insert Row command. Adding rows to the spreadsheet could corrupt the macros located to the right of the matrix.

Enter the label *SunfSds* in cell A7. Since you've added a new ingredient to the list, you'll need a new slack column. Note that adding columns to the spreadsheet is OK. Position the cell pointer anywhere in column H and select /Worksheet Insert Column (in *Symphony*, MENU Insert Columns) and press Return. Enter *SLACKs* in cell H2.

Next add the new formula to the table: Enter *2* in cell B7, *0* in cell C7, *1* in cell H7, and *2000* in cell J7. Copy the ratio formula in cell K6 to cell K7. Since we're dealing with mixtures that weigh 12 ounces, change the number in cell B3 to *4*.

Whenever you change the number of parameters in the matrix, you must make sure that the first label in the *\i* macro reflects the appropriate coordinates for the named ranges *matrix* and *botrow*. This ensures that the macro will initialize the worksheet correctly. *Matrix* should now have the coordinates B3..J8. *Botrow* should have the coordinates B8..I8. Therefore, change the entry that's now in cell Q7 to:

```
/RNCmatrix~B3..J8~/RNCbotrow~B8..I8~
```

In *Symphony*, use *{MENU}* in place of the two slashes.

The *\s* macro and its subroutines, however, need no modification. Press MACRO-S to find the optimal combination of nut mixtures. The ones in the bottommost matrix will indicate that Jordan should make 1,000 cans of regular and 33 cans of fancy mix.

Assume now that there's a third nut mixture—premium. This mixture has no peanuts or sunflower seeds but contains four ounces of almonds, two ounces of filberts, and six ounces of cashews. It has a profit per can of $1.10. In this case, the formulas should be:

Peanuts	4R + 2F + 0P + SLACKp = 5,000
Almonds	2R + 3F + 4P + SLACKa = 2,000
Filberts	2R + 3F + 2P + SLACKf = 2,100
Cashews	2R + 4F + 6P + SLACKc = 4,500
SunfSds	2R + 0F + 0P + SLACKs = 2,000
Profit	−.81 − 1.03 − 1.1 + Maximum = 0

Press MACRO-I to initialize the worksheet. Then insert a new worksheet column between columns C and D. Enter the label *"Prem* in cell D3. Then enter these values:

Cell	Value	Cell	Value
D3	0	**D6**	6
D4	4	**D7**	0
D5	2	**D8**	−1.1

The range *matrix* should now occupy range B3..K8; *botrow* should now occupy range B8..J8. Change the first label in the \i macro (now located in cell R7) to reflect these ranges. Press MACRO-I, then MACRO-S. When the macro stops, the 1s in the bottommost matrix indicate that the optimal combination is 1,000 cans of regular, 13 cans of fancy, and 30 cans of premium.

You may encounter situations where the solution directs you to forgo producing one of the mixtures. To see this, press MACRO-I, then change the profit on a can of premium mixture to $1.50 by replacing the entry in cell D8 with −1.5. Then press MACRO-S. This time, the 1s in the last matrix indicate that the best combination is 1,000 cans of regular and 40 cans of premium. The absence of ones in the *Fancy* column indicates that Jordan shouldn't produce any cans of fancy mixture. Given the higher per-can profit on premium mixture, the combination of 1,000, 0, and 40 does lead to the highest profit. But it may not be feasible to produce finished goods in such lopsided combinations. If the demand for the three mixtures were about equal, it might be better to ignore a result like this.

LINEAR PROGRAMMING IN YOUR OWN WORK

Before using this worksheet, you should be certain that you've developed formulas that accurately reflect your business problem. If your problem is much more complex than the Jordan Snacks case, you might want to consult a statistician.

In the examples, we added one component (the sunflower seeds) and one combination (the premium mixture) to the original scenario of four components and two combinations. You can expand the model even further, but you should avoid going beyond a total of 20 components and combinations. This worksheet is suitable for simple component-mix problems. With larger matrices, rounding errors have a greater affect on the final result. For more-complex situations, try using a stand-alone linear-programming package. Most of these make use of some technique for reducing errors in more-complex problems.

Although we didn't encounter any in the sample problems, there are cases for which the simplex algorithm can't find a solution. When this occurs, this worksheet will display the message *No solution found*. There are also rare situations in which there is more than one solution. The worksheet will only find one solution. When making business plans, consider the worksheet's results to be a feasible alternative, but weigh them carefully against other business considerations. ■

HOW TO SET UP THE OPTIMIZATION WORKSHEET

1. Releases

This model runs in *1-2-3* Releases 2.01, 2.2, and 3 and *Symphony* Release 2.0.

2. Default settings

Recalculation: Manual

1-2-3: /Worksheet Global Recalculation Manual
Symph: MENU Settings Recalculation Method Manual Quit

Column width: 7

1-2-3: /Worksheet Global Column-Width, enter 7
Symph: MENU Settings Width, enter 7, select Quit

3. Individual column widths

Column	Width
A	9
J	8
O	16

For example, to set the width of column A, position the cell pointer in column A and select

1-2-3: /Worksheet Column Set-Width, enter *9*
Symph: MENU Width Set, enter *9*

4. Labels

Enter the labels shown in figure 1. Right-align the labels in range B2..J2: Select /Range Label Right (*Symph*: MENU Range Label-Alignment Right) and specify range B2..J2.

Enter the labels shown in figures 2, 3, and 4. Remember to type an apostrophe when entering a label that begins with \, @, /, +, or −. To create the dashed lines in figure 4, enter 25 equal signs in cell P68 and copy cell P68 to cell P70.

Symphony users should use {MENU} instead of / in all cells except cell P42, where the / is used as a division symbol. *Symphony* users must use {MENU}E instead of /RE in cells P9, P24, P34, P55, and P63.

Note especially the shaded cells in figure 3. These are instructions for *1-2-3* or *Symphony* to create formulas using Arrow keys. In some cases, two or three cells are used to create one formula. Type these labels carefully and be sure to observe the tildes.

5. Values

Enter the values shown in figure 1 in range B3..I7.

6. Range names

Use the labels in column O to assign names to individual cells in column P: Press slash (*Symph*: MENU), select Range Name Labels Right, and specify range O1..O68. Then assign these additional names:

Name	Range
matrix	B3..I7
botrow	B7..H7
table	A2..J7

For example, to assign the name *matrix*, press slash (*Symph*: MENU), select Range Name Create, enter *matrix*, and specify range B3..I7.

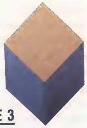
7. Formulas

Cell	Formula
J3	@IF(@INDEX(B3..H3,$pivot_col,0), I3/@INDEX(B3..H3,$pivot_col,0),0)

Copy cell J3 to range J4..J7.

P1	@ROWS(matrix)
P2	@COLS(matrix)

Save the worksheet.



RELEASE 3

Meet the MULTIDIMENSIONAL Worksheet

3-D features in *1-2-3* Release 3 help you organize and manage your data more effectively.

BY STEPHEN L. NELSON

Early releases of *1-2-3*, as well as *1-2-3* Release 2.2, provide two dimensions: height, measured in rows, and width, measured in columns. *1-2-3* Release 3 adds the third dimension of depth, which you measure in sheets. The term *sheets* may be new to you, but the concept is probably quite familiar. *1-2-3* Releases 1A, 2/2.01, and 2.2 display a single worksheet that resembles one large sheet of paper. In most cases, all your data and every formula and line of macro code for a model is located on this single sheet. In contrast, Release 3 can be configured to resemble a pad of paper containing many individual sheets of paper.

Once you think about the multidimensional worksheet as a pad of paper, you may immediately see two areas where multiple sheets can benefit your work: worksheet organization and worksheet consolidation.

First, with a multidimensional worksheet, you can organize various parts of a model on separate sheets. You might choose, for example, to store raw data on one sheet, calculations on a second, and macros on a third. By doing so, you can work on each sheet and not worry about obliterating a line of macro code or a series of complex calculations when you delete a column or row.

Second, you can instantly perform worksheet consolidations. Suppose you have several departmental budgets to roll into a summary budget. In the old days, you might have used many File Combine commands to consolidate the figures from many different worksheet files. Now you can have each department's budget and one summary budget on separate sheets in a single file. If a line item in a particular departmental budget changes, edit the value and the summary sheet is updated automatically.

A MULTIPLE-SHEET FILE

To illustrate the basics of working with a multidimensional spreadsheet, let's construct a model. Suppose you sell snow skis and windsurfing boards from two retail locations, one in Seattle and the other in Portland. You need to view your sales figures from several perspec-

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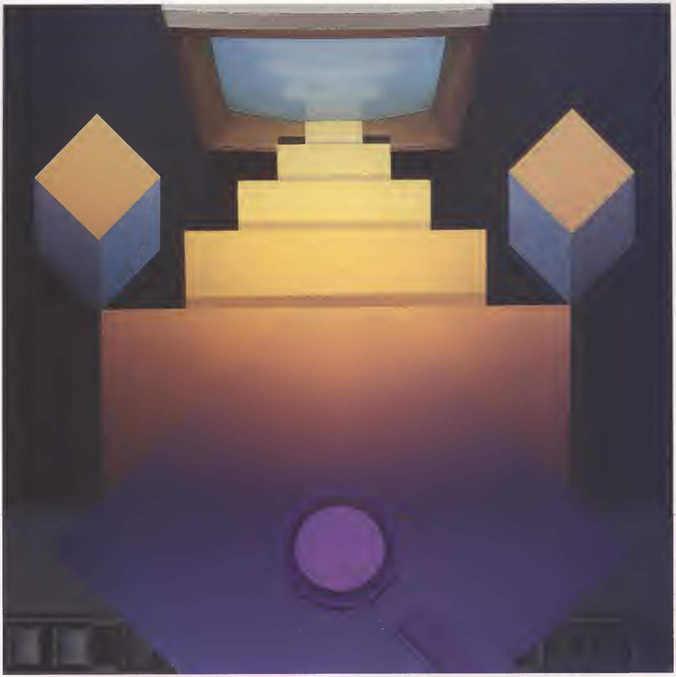
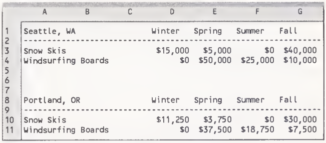


tives—by store location, by product, and by season.

If you arranged the sales data in a two-dimensional model, it might look like figure 1, which contains a table of information for each store location. Within each table is a breakdown of sales for each product in each season. You might create a third table containing calculations that generate consolidated sales figures. With such a small model, this probably doesn't seem like much work. But if you had 20 stores selling 200 products, managing that volume of data on a single spreadsheet would quickly become cumbersome. And the alternative of manipulating 20 files that must be updated regularly and combined into one consolidated report is not only time-consuming, but it's also prone to error.

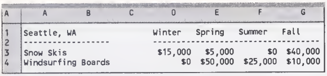
The easy solution is to use a multidimensional model in Release 3. To build one for this data, start in a new worksheet. Enter the sales data of the Seattle store, as



```
        A         B         C         D         E         F         G
1   Seattle, WA                    Winter    Spring    Summer    Fall
2   ---------------------------------------------------------------------
3   Snow Skis                     $15,000    $5,000        $0  $40,000
4   Windsurfing Boards                 $0   $50,000   $25,000  $10,000
5
6
7
8   Portland, OR                   Winter    Spring    Summer    Fall
9   ---------------------------------------------------------------------
10  Snow Skis                     $11,250    $3,750        $0  $30,000
11  Windsurfing Boards                 $0   $37,500   $18,750   $7,500
```

FIGURE 1. A typical two-dimensional worksheet

RALPH MERCER



```
A        A          B          C          D          E          F          G

1   Seattle, WA                        Winter     Spring     Summer     Fall
2   -----------------                  ---------------------------------------
3   Snow Skis                          $15,000     $5,000         $0   $40,000
4   Windsurfing Boards                      $0    $50,000    $25,000   $10,000
```

FIGURE 2. Sheet A of a multidimensional worksheet. The sheet letter is noted in the upper-left corner of the worksheet border.

shown in figure 2. Enter the text as labels and the sales figures as numbers. Enter a backslash and a hyphen in cell A2 and copy cell A2 to cell B2 and to range D2..G2. Then to set the default global format, press slash, select Worksheet Global Format Currency, and enter 0.

At this point, your worksheet is two-dimensional. To add the third dimension, use the Worksheet Insert Sheet command to insert a few more sheets. Using this command, you can insert one or more new sheets before or after the current sheet, which is the sheet currently containing the cell pointer. Insert two sheets after the current sheet by selecting /Worksheet Insert Sheet After 2.

You now have a blank sheet in which to work. This is worksheet B, identified by the letter that appears in the upper-left corner of the worksheet frame. The sheet into which you entered the Seattle store data is worksheet A. Sheet letters in Release 3 progress from sheet A through sheet IV, which is the 256th sheet. Now enter the sales data of the Portland store, as shown in figure 3.

NAVIGATING MULTIPLE SHEETS

Now that you have data in sheet B, you might want to go back to view sheet A. To move the cell pointer between sheets, you have several options.

The most frequently used method of moving the cell pointer is to hold down the Control key and press either the PageUp or the PageDown key. At first, the cell-pointer movements produced by pressing these keys may seem counterintuitive. However, once you see sheets displayed in perspective, a feature we'll examine in a moment, these cell-pointer movements make sense.

Pressing Ctrl-PageUp moves the cell pointer to the next sheet—for example, from sheet B to C. Pressing Ctrl-PageDown moves the cell pointer to the previous sheet. Using these keys is analogous to flipping through the pages of a magazine from front to back and back to front. To see how this works, press Ctrl-PageDown to view sheet A. Press Ctrl-PageUp to return to sheet B. The cell pointer moves to the cell in which it was located when you last used that sheet.

Two key combinations move the pointer to the beginning and end of the multidimensional worksheet. Like pressing the Home key in a two-dimensional worksheet, pressing Ctrl-Home moves the pointer to the Home position of the first sheet, which is usually cell A:A1. Press Ctrl-Home and you'll see the cell pointer move to sheet A, cell A1. Pressing the End key and then pressing Ctrl-Home moves the cell pointer to the last occupied cell (which may show an entry or may appear blank) in the last nonblank sheet. Press the End key followed by Ctrl-Home. The cell pointer moves to cell G4 of sheet B. Although your file has a sheet C, that sheet is currently blank. Therefore, the pointer stops at sheet B.

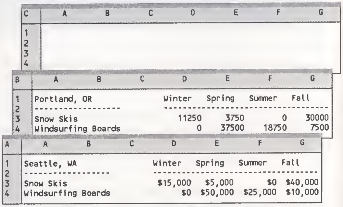
Additional key combinations for moving the cell pointer are End Ctrl-PgUp and End Ctrl-PgDn. You use these to move the cell pointer back or forward through worksheets in the current file. The cell pointer stays in the same row and column and moves forward or backward through the sheets to the next cell that contains data and has a blank cell in front of or behind it. These key combinations are analogous to the End-LeftArrow and End-RightArrow key combinations used in a two-dimensional sheet.

GROUP MODE

When you're working in a file that contains identically structured sheets—for example, a file similar to the sample model—you'll want to use Group mode. The Worksheet Global Group command allows you to enable or disable Group mode. When you enable this mode, *1-2-3* takes the current sheet's global settings, global formats, and range formats and assigns them to all of the other sheets in the active file. In addition, if you use any of the following commands while a file is in Group mode, all sheets in the file are affected:

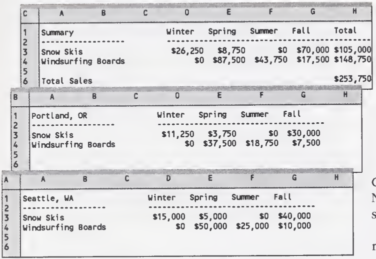
/Worksheet Column
/Worksheet Delete Column or Row
/Worksheet Global Format, Label, Col-Width, Prot, or Zero
/Worksheet Insert Column or Row
/Worksheet Page
/Worksheet Titles
/Range Format
/Range Label
/Range Prot
/Range Unprot

There is one caveat with respect to Group mode: Once you select it, the format and settings changes made to the other sheets in the file are permanent. Be sure that you



```
C        A          B          C          D          E          F          G

1
2
3
4

B        A          B          C          D          E          F          G

1   Portland, OR                       Winter     Spring     Summer     Fall
2   -----------------                  ---------------------------------------
3   Snow Skis                            11250       3750          0     30000
4   Windsurfing Boards                       0      37500      18750      7500

A        A          B          C          D          E          F          G

1   Seattle, WA                        Winter     Spring     Summer     Fall
2   -----------------                  ---------------------------------------
3   Snow Skis                          $15,000     $5,000         $0   $40,000
4   Windsurfing Boards                      $0    $50,000    $25,000   $10,000
```

FIGURE 3. Sheets A, B, and C of the sales model. Here the sheets are shown in perspective, which allows you to display three contiguous sheets at once. Sheet C contains no data now, but it will soon hold the summary worksheet.



```
C    A       B       C       D       E       F       G       H
1 Summary                   Winter  Spring  Summer   Fall     Total
2 ------------------        ---------------------------------------
3 Snow Skis                $26,250  $8,750      $0  $70,000 $105,000
4 Windsurfing Boards            $0 $87,500 $43,750  $17,500 $148,750
5
6 Total Sales                                               $253,750

B    A       B       C       D       E       F       G       H
1 Portland, OR              Winter  Spring  Summer   Fall
2 ------------------        ------------------------------
3 Snow Skis                $11,250  $3,750      $0  $30,000
4 Windsurfing Boards            $0 $37,500 $18,750   $7,500
5
6

A    A       B       C       D       E       F       G       H
1 Seattle, WA               Winter  Spring  Summer   Fall
2 ------------------        ------------------------------
3 Snow Skis                $15,000  $5,000      $0  $40,000
4 Windsurfing Boards            $0 $50,000 $25,000  $10,000
5
6
```

FIGURE 4. The complete sales model shown in perspective. Should you change a value on sheet A or B, the summary on sheet C is automatically updated.

want the changes made to every sheet in the file before you enable Group mode. As an added precaution, save the file before you enable Group mode. By doing so, you ensure that if you make a mistake while in Group mode, you can retrieve the file and start over.

To better understand Group mode, let's use it to complete the sales model. Notice in figure 3 that the Seattle store's data, located in sheet A, is formatted for currency with zero decimal places. Suppose you want the other sheets in the file formatted similarly. First move the pointer to the sheet containing the formatting that you want to use for all the sheets. Press Ctrl-PageDown to move the pointer to sheet A. Then enable Group mode by selecting /Worksheet Global Group Enable. The Group indicator appears at the bottom of your screen, indicating that Group mode is on and that the worksheet formats and settings from the current sheet have been applied to the other sheets in the active file. Now sheets B and C are formatted for currency with zero decimal places.

This is a fairly trivial example of using Group mode. The mode is most useful when you're just beginning to design an application made up of identically structured sheets. For such an application, you would create multiple sheets, turn on Group mode, and create the structure for one sheet. That "template" would be applied to all sheets in the current file. Then you can fill in the data.

CELL REFERENCES

In a two-dimensional model, a cell is identified by its location at the intersection of a column and a row. In a multidimensional model, you identify a cell by its sheet letter, column letter, and row number. A traditional cell reference would be A1, whereas a cell reference in a multidimensional model might be C:A1, meaning worksheet C, cell A1.

Suppose you want to construct a summary of your sales figures on sheet C. Sheets A and B already contain some labels you could use in sheet C, so let's use the Copy command to transfer them. In sheet A, select /Copy and specify range A2..B4 as the From range. Specify cell C:A2 as the To range. Next select /Copy and specify D1..G2 as the From range. Specify cell C:D1 as the To range. You now have created the basic form for the summary worksheet. Press Ctrl-PageUp twice to move the pointer to sheet C. Enter the label *Summary* in cell C:A1. Next you'll want to total the winter snow-ski sales for the Seattle and Portland stores. Go to cell D3 and enter the formula +A:D3+B:D3. Now copy cell C:D3 to range C:D3..C:G4 to total the seasonal sales figures for both products.

As you might have noticed, you made use of a cell-referencing shortcut. You don't need to identify the sheet letter if the cell is in the current sheet. For example, to enter a formula in cell C:H3 to add up the year's total snow-ski sales, enter the formula @SUM(C:D3..C:G3) or @SUM(D3..G3). *1-2-3* assumes that if you don't specify the sheet letter, you're referring to the current sheet. Copy cell H3 to cell H4. Add the labels shown in cells H1, H2, and A6 of figure 4. Enter the formula @SUM(H3..H4) in cell H6. Your multidimensional model is complete.

SOME NEW COMMANDS

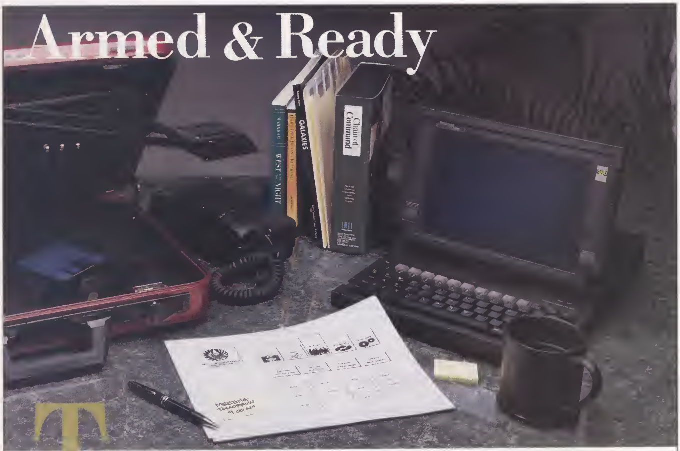
Once you've built a multidimensional model, you'll use several new commands to view and manage it. These include Worksheet Window Perspective, Worksheet Delete Sheet, and Worksheet Hide.

With multiple sheets in a model, you'll probably want to view more than one sheet at a time. To display three consecutive sheets at once, use the Worksheet Window Perspective command. Since your model for sales figures contains three sheets, let's view them all at once. Select /Worksheet Window Perspective. You'll see sheets A, B, and C stacked one behind the other. If this file contained only two sheets, you would see a blank window in place of the third worksheet. To move the cell pointer between sheets, press the WINDOW key. If the file contained more than three sheets, you would use the key combinations Ctrl-PageUp and Ctrl-PageDown to move other sheets into the three windows. When you want to view one sheet at a time, select /Worksheet Window Clear.

Occasionally, you'll want to delete an existing sheet. To do that, you use the /Worksheet Delete Sheet command. This command will not let you delete a sheet if it is the only one remaining in the file.

When a sheet contains information you don't want or need to see, you can hide it. Use the /Worksheet Hide Enable command and then specify the range of sheets to hide. This command will not let you hide a sheet if it is the only sheet in the file. It also won't let you hide a sheet if it is the only remaining unhidden sheet in the file. When you need to see a hidden sheet, select /Worksheet Hide Disable and specify the sheet—for example, B:A1. ■

Armed & Ready



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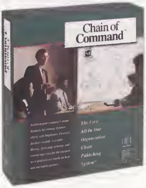

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This series
of procedures may help you
successfully run *1-2-3* Release 3.

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BY ERIC MANN

If you have been unable to install or run *1-2-3* Release 3 in a DOS environment, the procedures outlined here should help you. You may also want to pass them on to a colleague who's having trouble.

To solve your problem, you don't have to know all the technical details. But you may find the steps easier to follow if you understand such matters as the difference between extended memory and expanded memory. The glossary on page 58 explains the essential technical terms and concepts. The Release 3 *Reference Manual*'s Appendix 4, Memory Management, is another useful resource.

Release 3 runs on computers that have a '286 or '386 microprocessor and at least 1 megabyte of combined conventional and extended memory that's not tied up with other software. If you're unsure whether your computer meets these specifications, check your hardware documentation, talk to your dealer or technical-support people, or use the *Lotus CHK1-2-3* program (see the box on page 62). If your computer uses a '486 processor, Release 3 should run, but Lotus Development Corp. does not yet officially support these new processors.

To do a good job of troubleshooting, you must follow the procedures very carefully. You must be prepared to skip from section to section when so directed.

There are two classes of installation problems. One, you are unable to complete the installation procedure. Two, you install the software, but it does not function properly. Some malfunction examples are:

- Your keyboard does not work properly when you use *1-2-3*.
- *1-2-3* can't load a *1-2-3* program file, and you get the message *Error loading driver file* . . . .

ILLUSTRATIONS BY DAVE JONASON

A majority of problems with Release 3 installation are the result of a harmless-looking line in the AUTOEXEC.BAT or the CONFIG.SYS file.

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- Your system won't switch into Protected mode, and you get the message *DOS/123 Protected mode failure.*
- You encounter an *Unexpected interrupt* message.

'CLEANING' THE SYSTEM

The first task is to "clean" your system. This means making sure that when you try to install Release 3 it isn't fighting for a memory address that is occupied by a program that your system loaded automatically when you turned it on. A majority of problems with Release 3 installation are the result of a harmless-looking line in the AUTOEXEC.BAT file or the CONFIG.SYS file.

The first step is to disable your AUTOEXEC.BAT file and most of your CONFIG.SYS file. Don't worry. We'll tell you how to restore those files later on.

Here's what to do:

1. Turn on your computer and get to the DOS prompt on the startup drive, usually drive C.

2. Type *cd* and press Return to get to the root directory on the startup drive.

3. Type *rename autoexec.bat auto.old* and press Return. This changes the name of your AUTOEXEC.BAT file to AUTO.OLD so that DOS won't find this startup file and thus won't load any extraneous software while you troubleshoot.

If you typed the command correctly and you received the following error, *Duplicate file name or File not found,* your system does not have an AUTOEXEC.BAT file. Unless some step in the troubleshooting process indicates that you need to have a particular command automatically execute when your system starts up, you can ignore the instructions in the Wrap Up section that describe how to restore your AUTOEXEC.BAT file. If you do need to create an AUTOEXEC.BAT file, you'll find instructions in the Editing a Text File section.

4. If you have a parallel printer, turn it on, type *type config.sys>prn*, and press Return. This will print out a copy of your CONFIG.SYS file. If there's no local printer, or if your printer uses a serial rather than a parallel connection, use the command, but omit *>prn* so that the file will print to the screen. Then write down the contents.

5. Type *rename config.sys config.old* and press Return. This changes the name of the CONFIG.SYS file to CONFIG.OLD so that DOS won't find this other startup file and thus won't load any drivers while you troubleshoot.

6. As a precaution, make a backup copy of your system files. Assuming your system had an AUTOEXEC.BAT file, type *copy auto.old autoexec.sav* and press Return. Then type *copy config.old config.sav.* You should not need these files during the troubleshooting steps, but they will be available to be copied to AUTOEXEC.BAT and CONFIG.SYS, respectively, should you make a mistake in editing your system files. If you do restore your AUTOEXEC.BAT or CONFIG.SYS files be-

A GLOSSARY OF ESSENTIAL TERMS

Conventional Memory is random access memory (RAM) between 0 and 640 kilobytes. This is the memory that DOS makes accessible for application software and user data.

Expanded Memory is RAM that meets the LIM-EMS (Lotus/Intel/Microsoft Expanded Memory Specification). It uses a bank-switching technique, which allows one block of memory to act as a window onto other blocks of memory. You can use up to 32 megabytes of LIM-EMS 4.0 memory with *1-2-3* Release 3. Expanded memory is much slower than extended and conventional memory, and applications such as Release 3 fill expanded memory with data before storing any data in extended or conventional memory.

Extended Memory is RAM above 1 megabyte on '286, '386, and '486 computers. You address extended memory by putting the processor into Protected mode. Most applications can't use Protected mode because DOS wasn't designed for it. *1-2-3* Release 3 has a built-in Protected-mode interface, also known as a DOS extender, which allows you to use up to 15 megabytes of extended memory. *1-2-3* loads as much of its code as possible into extended memory to leave maximum conventional memory for your network software and TSRs (terminate-and-stay-resident programs).

Real Mode is the mode of a '286, '386, or '486 microprocessor that emulates the 8086 microprocessor found in many early personal computers. When the processor is in Real mode, it can address up to 1 megabyte of memory and can run one application program at a time—the same as an 8086 processor. Only 640K of this memory is available to applications under DOS. When running DOS in Real Mode, the remaining 384K is usually available only to the system and cannot be used for applications or data.

Protected Mode is the mode of a '286, '386, or '486 processor that allows it to address extended memory and to multitask. In Protected mode, the '286 processor can address up to 15 megabytes of extended memory and can run as many as 16 sessions simultaneously.

To do a good job of troubleshooting, you must follow the procedures very carefully. You must be prepared to skip from section to section when so directed.

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fore you complete your troubleshooting, remember to start again with the first step of this section.

7. Type *copy con config.sys* and press Return. The cursor jumps to the next line and waits for you to start typing. This step starts building a new, temporary CONFIG.SYS file. Release 3 installation does require that DOS get certain commands from such a file.

8. Type *files=20* and press Return.

9. Type *buffers=20* and press Return.

10. Now check the printout or your notes concerning the original CONFIG.SYS file. If it contains a line specifying a device driver for your hard disk, include that line in the temporary CONFIG.SYS file. Get help if you're not sure you recognize such a line. An example of such a statement is:

```
device = dmdrvr.bin
```

Most hard disks do not require a device statement.

11. Press the F6 key to close your file and then press Return to save it to disk. You'll see the message *1 File(s) copied.*

12. Turn off the computer, wait about 30 seconds, and turn it on again. Do not use Ctrl-Alt-Del to restart your computer. Note that because the AUTOEXEC.BAT file is missing, your screen may look different from the way it usually looks upon startup.

13. As the computer warms up, the amount of memory installed will count up on the screen. Write down the total. If the number is less than 1024, that's at least one reason you have a problem.

14. If your computer allows you to set its processing speed, be sure to select the slowest setting. With some computers, you use a "turbo" switch; others require that you use special commands. Consult your owner's manual for details. If during troubleshooting you have to restart your computer, remember to reset your system to the slowest speed.

At this point, with a clean system, the next step depends upon the nature of your problem. If you have successfully installed *1-2-3*, but it does not run properly, skip now to the Testing 1-2-3 section. If you never were able to complete the Release 3 installation, read on.

TRY AGAIN TO INSTALL

Now's the time to run the Install program again. Here's how:

1. Put the Install disk in drive A.
2. Type *a:* and press Return.
3. Type *install* and press Return.
4. Follow the instructions in the Install program.

If you successfully complete the install procedure, go to the following section, Testing 1-2-3, to see if the software runs properly. If you still cannot complete the installation, skip to the Still Not Working section on page 63.

TESTING 1-2-3

This section assumes that you successfully completed installation. Be sure your system is still clean; don't reinstate those original AUTOEXEC.BAT and CONFIG.SYS files yet. Follow the steps below to ensure that *1-2-3* runs properly on your machine.

1. Type *c:* and press Return. Substitute a different drive name if you installed *1-2-3* on a drive other than C, which is the default drive.

2. Type *cd\123r3* and press Return. Substitute a different directory name if you installed *1-2-3* in a directory other than 123R3, which is the default installation directory.

3. Type *123* and press Return. If a "normal" worksheet appears, proceed to the next step. Be aware that a normal Release 3 worksheet looks a bit different from a Release 2.01 worksheet: The text is displayed in a different style, and the current row, column, and worksheet names are highlighted. If a worksheet does not appear, or if a worksheet appears but looks significantly different from what you expect, skip to the Check Your Hardware section on page 60.

4. Select /Worksheet Status and press Escape. Your worksheet should return to Ready mode.

5. Select /File Retrieve, highlight the file name SALES.WK3, and press Return. This worksheet is one of the sample files that come with Release 3. Move the cell pointer to cell B8 of the current worksheet and press the GRAPH key (F10 on most computers). A graph should appear. Press Escape. Your worksheet should return to Ready mode.

6. Press the HELP key (F1 on most computers). A help screen should appear. Press Escape. Your worksheet should return to Ready mode.

7. Select /Quit Yes Yes. You should see a DOS prompt.

If your software passed all the tests in steps 4 through 7, you're in good shape. Skip to the Wrap Up section on page 62.

If steps 4, 5, 6, or 7 indicated a problem, restart your computer and go directly to the following section, SET DOS16M Commands.

SET DOS16M COMMANDS

This is where you should be if you had problems in steps 4, 5, 6, or 7 of the previous section.

Problems you may have encountered in those test steps are listed below. If you had one of the problems, try the suggested solutions. Then repeat the Testing 1-2-3 section to see if you've fixed the problem. Keep notes on which solutions did work and which didn't work. If none of the commands work, skip to the Still Not Working section.

You may find the steps easier to follow if you understand such matters as the difference between extended and expanded memory. The glossary explains the essential concepts.

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Problems

1. When you try to load *1-2-3*, the computer freezes.

2. You can load *1-2-3*, but you have keyboard problems. For example, the keyboard freezes, you have to press keys several times for the computer to respond, the machine beeps whenever you press a key, or you type one character and a different one appears.

3. You get the message *Unexpected interrupt*.

Solutions

These problems usually occur when your computer uses a technique for switching from Protected to Real mode that differs from the method used by IBM, Compaq, and Toshiba.

Enter at the DOS prompt one of the commands in the accompanying box before loading *1-2-3*. They tell *1-2-3* to use a different method for switching the processor from Protected to Real mode. If you find one that resolves your problem, read on and we'll tell you how to include the command in your AUTOEXEC.BAT file. Start at the top of the list and work down. The commands are listed in order of their proven effectiveness. The Application column below describes types of computers for which a particular command has proven the ideal choice. If you don't find a description that matches your computer, or if the command described for your computer doesn't solve the problem, work your way through the commands on the list. Keep notes on which solutions did and didn't work. The *CHK1-2-3* program provides further information on the SET DOS16M commands.

Command	Application
SET DOS16M=10 SET DOS16M=10,750	Start with the first of these commands for '286 machines that use the "fast" method of switching from Protected to Real mode. If it doesn't work, restart your computer and try the next command.
SET DOS16M=9 SET DOS16M=9,750	Start with the first of these commands for '286 machines that use a "standard" method of switching from Protected to Real mode. If it doesn't work, restart your computer and try the next command.
SET DOS16M=13	Use this command for AST Research '286 machines with older keyboard ROM chips.
SET DOS16M=7	Use this command for machines with older Phoenix Technologies ROM chips.
SET DOS16M=6	Use this command for some AT&T PC 6300 series machines.
SET DOS16M=2	Use this command for IBM PS/2 '286 machines.
SET DOS16M=3	Use this command for some '386 computers without VCPI drivers.

If one of these commands solved the problem, proceed to the Wrap Up section on page 62 to learn how to add the command to your AUTOEXEC.BAT file and how to return your system to normal.

If none of these commands solves the problem, try switching keyboards with another machine, preferably an IBM or Compaq. If *1-2-3* works with the other keyboard, you probably need to upgrade your keyboard ROM. An upgrade is usually available from the manufacturer.

If switching keyboards solved the problem, skip to Wrap Up to restore your system files. If Release 3 still does not run on your machine after you switch keyboards, skip to the Still Not Working section on page 63.

CHECK YOUR HARDWARE

This is where you should have landed if, in running *1-2-3* with a clean system, you did not get a worksheet on your screen, or you got one that didn't look right.

We'll take up those two problems separately below. Look for the problem that resembles yours and try the suggested solution. Then return to the Testing 1-2-3 section to see if you've fixed the problem. If the solutions here don't solve the problem, go to the SET DOS16M Commands section on page 59.

Problem

When you try to load *1-2-3*, you see one of the following error messages: *Not enough memory to load...*, *Error loading driver file...*, or *Error reading driver file....* These messages indicate that your computer does not have enough combined conventional and extended memory available to load *1-2-3*.

Solutions

1. Make sure you have enough conven-

If you don't need expanded memory for your other applications, configure all your memory as extended, which is much faster.

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tional memory and enough extended memory. The memory count that you noted after restarting your computer should have been at least 1024K (1 megabyte). If it was lower than 1024, you'll need more extended memory to run Release 3. If you know that your computer contains enough memory but the count is less than 1024, then some of your memory may have been configured as expanded memory rather than as extended memory. See your hardware documentation for the steps necessary to reconfigure your system's memory.

2. Make sure your computer does not reserve memory. If your computer has a megabyte of combined conventional and extended memory and you get one of the error messages that are listed above, your machine probably reserves memory for certain technical functions, such as a video buffer or shadow RAM. If your computer reserves memory, see its documentation to learn if and how you can release all or part of that memory. On some Toshiba computers, for example, you can run the *Test3* program in the DOS directory to reallocate memory. If your system does not allow you to release this memory, you will need to install some additional extended memory to run Release 3.

USING EXPANDED MEMORY WITH RELEASE 3

If you don't need expanded memory for your other applications, configure all your memory as extended, which is much faster. As long as *1-2-3* has 384K of extended memory that it can use, you can use Release 3 and can keep some of your memory as expanded. If you do need expanded memory, here's what you need to know.

There are two ways of getting expanded memory:

- Having an add-in memory board that is configured as expanded memory and the device driver that goes with it
- Using an expanded memory manager—or emulator—that converts extended memory to expanded memory

If you need expanded memory, here's how to configure it:

'386 Machines On a '386 machine, you may use either an add-in memory board and its matched driver, such as the Intel Above Board and EMM.SYS 4.0, or a VCPI expanded memory manager (or emulator), such as CEMM 4.0 or higher, a file on Compaq's User Programs disks, or 386$^{\text{Max}}$ version 4.03 or 4.05 to configure your system with expanded memory.

If you use an expanded memory manager, it must meet the VCPI specification and you should use it to reconfigure all of your extended memory as expanded. For example, if you have a Compaq 386 with 4 megabytes of total memory, you have 3 megabytes of extended memory. For that computer, the device statement in your CONFIG.SYS file should read:

```
device = c:\cemm.exe 3072
```

'286 Machines On a '286 machine, you may have an add-in memory board and be using its matched driver to configure the board's memory as expanded.

In some cases, an extended memory emulator will work with *1-2-3* Release 3 on a '286 machine. Lotus does not support this configuration. And the expanded memory that's configured by such a driver will not be converted to extended when *1-2-3* is loaded.

Problem

You can load *1-2-3*, but the screen is not readable.

Solutions

Some of the solutions that follow call for you to change your computer's display mode. If you do so, remember to reconfigure *1-2-3* to that same mode. Keep in mind that you may have to reconfigure your other software, as well. To change *1-2-3*'s display mode, run the Install program from your hard disk. This is faster than completely reinstalling the program from floppy disks. The Install program will be in the same directory as *1-2-3*, which is C:\123R3 unless you specified otherwise.

1. Set your screen-display card to CGA mode. Some screen-display cards can switch among various display modes, such as CGA, Hercules, EGA, and VGA. Even if your display card automatically switches among modes, set it specifically to CGA, not to autoswitching. If your display card offers more-sophisticated graphics modes than CGA, also try the other modes until you determine the highest resolution mode that works. Check your hardware documentation for instructions.

2. If you have a single-color screen display, such as the LCD displays on most portables, use the *Install -m* command when you load the Install program and the *123 -m* command when you load *1-2-3*. If the *-m* parameter resolves the problem, jot down this command: SET 123CPBW=YES. You will include that command in your AUTOEXEC.BAT file when you get to the Wrap Up section on the next page.

3. Make sure that all connections and switch settings are correct. Be sure that the cable connecting the display card to the monitor is properly configured and

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CHK1-2-3 identifies the hardware in your system, suggests changes that would help you run Release 3, and provides a glossary of technical terms.

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that the switches on the monitor are set for the display card you're using.

4. You may also try using a different graphics card that more closely emulates the ones listed in the Install program.

WRAP UP

If *1-2-3* ran properly after you cleaned your system, the problem was caused by software loaded by the CONFIG.SYS or AUTOEXEC.BAT file. You will need to remove or edit the line(s) that load the conflicting software. Or you may need to add one or more lines to automate commands that your troubleshooting indicated would help run *1-2-3*. See the section below on Editing a Text File for instructions.

Here are the most common scenarios:

Protected Mode Failure If 1-2-3 worked properly after you cleaned the system, and if you had been getting a *DOS/123 Protected mode failure* message, then a command in your original CONFIG.SYS file probably was loading an expanded memory manager—or "emulator"—that does not meet the technical specification called VCPI, for Virtual Control Program Interface. If you do not need expanded memory for another software package, you will want to remove the line from your CONFIG.OLD file before you reinstate it. *1-2-3* will automatically address the extended memory on your machine. If you have software that needs expanded memory, get a VCPI expanded memory manager, or emulator, from a software dealer and use it to configure all your system memory. See the box on page 61.

Error Loading Driver File... If *1-2-3* worked properly after you cleaned the system and if you had been getting an *Error loading driver file*... message, your original CONFIG.SYS file probably was loading an optional program—such as a disk cache, a RAM disk, or an expanded memory manager—that used memory that *1-2-3* requires.

Check the documentation that came with this optional software to see how to change or reduce the memory it reserves. If the troublemaker is an expanded memory manager and you don't need expanded memory for another software package, you'll want to remove the line that loads that memory manager from your CONFIG.OLD file before you reinstate it. See the following section on Editing a Text File.

CHK1-2-3 EXAMINES YOUR COMPUTER

CHK1-2-3, a free utility from Lotus Development Corp., identifies the hardware in your system, suggests changes that would help you run Release 3, and provides a glossary of technical terms. If you are unsure whether your computer has sufficient hardware to run Release 3, you can find out quickly and easily with *CHK1-2-3*.

You can get *CHK1-2-3* through your local Lotus Authorized Reseller, a Lotus sales representative, a Lotus Authorized Training Center, or through Lotus CD/Prompt. If you are unable to get a copy through a local source, call Lotus Customer Service at 800-345-1043.

If your original CONFIG.SYS file contained several memory-management commands, it may not be clear which or how many of them are causing problems. In such a case, you may have to repeat the editing and retesting process on your CONFIG.SYS file several times before you learn what commands are compatible with *1-2-3* Release 3.

The SET Commands If a SET DOS16M command resolved the problem, that means your machine uses a technique for switching from Protected to Real mode that requires the command that enabled your computer to run *1-2-3*. You'll need to append that command to your AUTO.OLD file before you rename it. See the following section on Editing a Text File.

The *-m* Parameter If you had a screen-display problem that was resolved by adding the *-m* parameter when loading *1-2-3*, you'll need to add the command SET 123CPBW=YES to your AUTO.OLD file before you rename it. See the following section on Editing a Text File.

TSRs Although it is not one of the most common problems, terminate-and-stay-resident programs may conflict with Release 3. If your problem was solved by cleaning the system, and if the problem reappears after you follow all the other appropriate troubleshooting steps, delete from your AUTOEXEC.BAT file some or all of the commands that load TSR programs. If you do eliminate TSR commands from your AUTOEXEC.BAT file, you can continue to use them by loading them at the DOS prompt. Just remember to unload them or restart your computer before you run Release 3.

EDITING A TEXT FILE

If you have a text-editing or word processing program that can produce ASCII files, you can call up the CONFIG.OLD and AUTO.OLD files and modify them directly. One such program, though an awkward one to use, is the EDLIN line editor that is probably in your DOS subdirectory. If you don't have such a word processor and aren't acquainted with the EDLIN line editor, here are some alternatives. Afterward, proceed to the following Restore Your System Files section.

Adding a Line

To append a SET DOS16M command to the end of your AUTO.OLD file:

1. Type *copy auto.old + con* and

If *1-2-3* ran properly after you cleaned your system, the problem was caused by software loaded by the CONFIG.SYS or AUTOEXEC.BAT file.

press Return. The screen will show AUTO.OLD on the next line and the word *con* on the line below that. The cursor jumps to the following line and waits for you to start typing. If, when you cleaned your system, you found that no AUTOEXEC.BAT file was present, use the following command instead: *copy con auto.old*

2. Type the SET command you want to add and press Return.

3. Press the F6 key to close the file and then press Return to save the revised file to disk. You will get the message *1 File(s) copied.*

Removing a Line

To remove a line from your CONFIG.OLD file, you can use any version of *1-2-3*. Follow these steps:

1. Load *1-2-3*.
2. Select /File Import Text.
3. Press Escape enough times to eliminate the default path.
4. Type the path and file name of the file you want to import. For example, type *c:\config.old* and press Return. *1-2-3* will bring the text file into the worksheet.
5. Move the cell pointer to the cell containing the line you wish to remove.
6. Select /Worksheet Delete Row and press Return.
7. Select /Print File to instruct *1-2-3* to print an ASCII text file on disk.
8. Press Escape enough times to remove the default path.
9. Type the path and file name of the file you wish to change—the same path and file name you specified when bringing the file into memory. For example, type *c:\config.old* and press Return.
10. Select Replace to indicate you wish to replace the file on disk.
11. Select Range and highlight all the text that you wish to include in the file. Be sure to highlight all columns in which text is displayed, not just column A. Press Return.
12. Select Options Other Unformatted Margins Left, enter *0*, Margins Right, enter *240*, and select Quit Align Go Quit.

Obviously, you can use this same technique to edit rather than to delete a line in the file—such as a command allocating memory to a cache.

RESTORE YOUR SYSTEM FILES

You have now modified your original AUTOEXEC and CONFIG files and you need to rename them so that DOS will find them when you start your computer. Here's what you do:

1. If you are running *1-2-3*, quit to a DOS prompt.
2. Type *c:* and press Return to make C the current drive. If your system uses a different startup drive, specify that drive instead of C.
3. Type *cd* and press Return to get to the root directory of the startup drive.
4. Type *rename auto.old autoexec.bat* and press Return to rename the file called AUTO.OLD to AUTOEXEC.BAT. You must spell AUTOEXEC.BAT correctly for DOS to find it.
5. Type *erase config.sys* and press Return to delete the temporary CONFIG.SYS file that you created.
6. Type *rename config.old config.sys* and press Return to rename the file called CONFIG.OLD to CONFIG.SYS. You must spell CONFIG.SYS correctly for DOS to find it.
7. Now press Ctrl-Alt-Del to restart your computer.

At this point, you're back more or less where you started, although you may have added a SET command to your AUTOEXEC.BAT file and possibly deleted a device statement from your CONFIG.SYS file.

STILL NOT WORKING

This is where you should be if you were still unable to install *1-2-3* after cleaning the system or if *1-2-3* didn't work properly after you tried the SET DOS16M commands and after you made sure that your hardware was set up correctly.

If you were unable to install, you either have incompatible hardware or you are working with a damaged *1-2-3* disk. Take your disks to another PC, preferably an IBM or Compaq, and try to install the program again. If the installation works on the other machine, the problem is with your computer and you should contact your hardware dealer. If the installation fails on the second machine, you may have a damaged disk. See your DOS reference manual for instructions on running the CHKDSK program to test for disk problems. If CHKDSK is in the DOS directory on drive C, you can check a floppy disk in drive A with the following command: *c:\dos\chkdsk a:*

For details on replacing disks, contact your dealer or see Appendix 1 of the *Lotus 1-2-3 Release 3 Setting Up* guide, which came with your software.

If you were able to install *1-2-3* and you have enough available memory, but you could not run *1-2-3* after cleaning your system and stepping through the troubleshooting procedures, you may have an incompatible machine. Check with a dealer and ask how that machine can run Protected-mode software. The manufacturer may supply a ROM BIOS upgrade to solve the problem.

Even if you were unable to solve your problems by trying these procedures, you'll want to return your system to normal. Follow the procedures in the preceding section, Restore Your System Files. ■

Eric Mann is a senior support specialist at Lotus Development Corp.

RELEASE 3

11 *TIME TRIALS*

Concerned about spreadsheet speed? A comparison of *1-2-3* Releases 2.2 and 3 holds a few surprises.

BY DANIEL GASTEIGER

Last July's special report, The New Releases, introduced Lotus Development Corp.'s latest versions of *1-2-3*. That report provided overviews of the new features in *1-2-3* Releases 2.2 and 3. But because only prerelease software was available when we prepared the report, we couldn't completely evaluate the performance of each product. Instead, we promised that a later report would divulge their relative speeds.

The special report predicted that even though Release 3 would be chock-full of exciting new features, it would be slow. This release was rewritten primarily in C rather than in assembly language. Therefore, it seemed unlikely that anyone could squeeze high-speed performance from such a complex product.

On the other hand, Release 2.2 was built on the original assembly code of Release 2.01. True, Release 2.2 lacks

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many of the superior features of Release 3. However, because Release 2.2 was written in assembly language, we predicted that it would be faster than Release 3.

As is often the case with this type of product comparison, there is no absolute winner. But in most of the 11 tests, *1-2-3* Release 2.2 proved faster and more memory-efficient than Release 3. As you review the bare results in the table below, be aware of several possible limitations of our testing methodology. First, the tests evaluate how fast *1-2-3* Releases 2.2 and 3 *run* an application, not how quickly you can build a worksheet in each release. Second, we did not conduct any tests on computers equipped with math coprocessors. Third, we used a macro to perform the tests and record the results.

THE METHODOLOGY

We obtained copies of Releases 2.2 and 3 that were just like those you get when you upgrade from earlier releases. Then we performed tests on three hardware platforms.

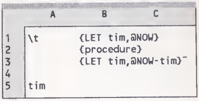
For the first series of tests, we used an 80286-based computer with 1 megabyte of RAM and DOS 3.3. Working entirely within DOS, we installed both releases of *1-2-3* on the hard disk and configured them as similarly as possible. Then we ran the 11 time trials.

We repeated the tests using an 80386-based computer with 6 megabytes of RAM, 5 megabytes of which were configured as extended memory. We did not use memory-management software. Thus, the slow speed generally associated with expanded memory was not a factor in this series of tests.

Understanding that Release 3 was written to run in OS/2 and in DOS, we repeated the tests on a third hardware configuration—an 80386-based computer with 6 megabytes of RAM. We installed *1-2-3* Release 3 to run under OS/2 and ran Release 2.2 in OS/2's DOS compatibility box.

This installation represented the most even comparison we could devise involving OS/2. It let both products run entirely within the operating system. However, we recommend that anyone running Release 2.2 on a high-end machine forgo OS/2 and stay within DOS release 2.0 or higher. The DOS compatibility box provides access to only 512K of RAM. If you work entirely within DOS, you can use the Lotus/Intel/Microsoft Expanded-Memory Specification to access up to 4 megabytes of RAM.

Some of the tests were based on material presented in *LOTUS*. To obtain accurate and consistent test results, we used the simple macro shown here to record the time that elapsed while *1-2-3* performed a particular time trial.



```
      A          B           C
1  \t         {LET tim,@NOW}
2             {procedure}
3             {LET tim,@NOW-tim}~
4
5  tim
```

The macro's first command records the time you start the macro. The second command calls the subroutine *procedure*. For each test, *procedure* contains the commands and keystrokes that perform a particular task. After the macro processes the commands in *procedure*, it processes the {LET} statement in cell B3. That statement subtracts the macro's starting time from the current time and records the difference in the cell named *tim*.

We used this macro technique because many of the time trials involved procedures that took only a few seconds and because it provided greater accuracy than we could achieve using a stopwatch.

RELEASE 3 CONSIDERATIONS

A macro-based approach to testing Release 3's performance is inherently flawed because the product behaves differently under macro control than it does under manual control. In addition, this release contains two features—background recalculation and a built-in print buffer—that provide an edge that's difficult to measure without applying the product to your own spreadsheet problems.

Background recalculation lets you recalculate a worksheet while you make entries or assign graph or database settings, for example. So, although Release 3 might take

SPEED-COMPARISON TABLE

	DOS on 80286		**DOS on 80386**		**OS/2 on 80386**	
Task	**Rel. 2.2**	**Rel. 3**	**Rel. 2.2**	**Rel. 3**	**Rel. 2.2**	**Rel. 3**
Addition A	1	3.50	1	1	1	2
Addition B	1 (or more)	1	1 (or more)	1	1 (or more)	1
1-Way Data Table	1	23	1	13	1	18
2-Way Data Table	1	1.25	1	1–2	1	1
3-Way Data Table	1	3.50	1	3.50	1	3
Cell-Pointer Movement	4	1	4.75	1	7.25	1
Movement with Windows Off	2	1	1.66	1	2.50	1
Macro No-Op	1	3	1	4	1	3
Project Schedule	1	4.50	1	2.50	1	5
Loan Analysis	1	4	1	3	1	6
Graphs	1	1	1	1	1	1
RAM Usage	1K	1.66K	1K	1.50K	1K	1.66K

This table compares the products' performance on each task as a ratio. The value 1 in a particular column indicates the faster product for that trial. The value in the opposite column indicates how many times as long the other product took to perform the same task.

longer than Release 2.2 to calculate some worksheets, you'll be able to work during recalculation. But background recalculation is a mixed blessing. It's an advantage when you're not immediately interested in the effect of each change to your worksheet. It's not an advantage when you change a variable and immediately want to see its effect on the worksheet's bottom line.

The built-in print buffer also allows you to use what was otherwise idle time. When you send output to the printer, *1-2-3* Release 3 stores the output in RAM and returns control of the worksheet to you. The printer marches along at its own pace while you retrieve a new worksheet, assign new print ranges, or whatever.

You may already have installed print-buffer software that came with your extended-memory boards. If you have customized your system, Release 3's print buffer may not increase your productivity in the least.

Release 3's biggest win is in raw functionality. You'll have to decide if you agree, based on the tasks you typically perform with *1-2-3*. For example, the ability to write complex formulas that tie several worksheet files together will save you hours if your data is distributed among many files. In addition to the test results, factor in information from our original report in the July 1989 issue when you judge the performance of the two releases.

THE TESTS

What follows is a brief description of the worksheets and procedures used to compare the performance of the new releases. In most cases, the results stand on their own and require no further discussion.

However, the results of tests 1 and 2, both of which involve automatic spreadsheet recalculation, and the results of tests 6, 7, and 8, which test macro processing, require some additional commentary. You'll find that discussion in the Selected Test Results section.

1. Addition A

This test's worksheet contained 3,492 addition formulas that all referred in some way to a single cell. The procedure was to enter the value *2* into the cell upon which all others relied. The sheet was in automatic-recalculation mode, so all the formulas that relied on the entry were recalculated. Then the macro recorded an elapsed time.

2. Addition B

Again we used the worksheet containing 3,492 addition formulas. In this case, we varied the number of formulas that relied on the cell whose value the macro changed. In some trials, only 20 formulas relied on the variable. In other trials, 400 formulas relied on the variable.

3. 1-Way Data Table

This test's worksheet contained a database of more than 300 records. We created a data table that calculated the results of five database statistical @functions—@DSUM, @DAVG, @DMIN, @DMAX, and @DSTD—for each of seven criteria. The Data Table command substituted wildcard criteria, such as A* and S*, into the Criterion range, and by doing so performed its statistical calculations for entries that began with specific letters.

4. 2-Way Data Table

We created a data table that was 6 columns by 42 rows. For the first time trial, the table calculated the result of the formula *+row^col*. *Row* was the value to substitute in the first input cell. *Col* was the value to substitute in the second input cell. For a second trial, we devised an arbitrary formula that included trigonometric @functions and that performed addition, multiplication, division, and exponentiation.

5. 3-Way Data Table

In the June 1987 1-2-3 Macros column, we presented a macro that can calculate values for a 3-way data table. The macro grew out of techniques we had developed to create macro-driven 1-way and 2-way data tables that outperform the built-in Data Table commands.

6. Cell-Pointer Movement

The macro in this worksheet contained 300 rows of identical macro commands. Each row of commands sent the cell pointer once around the worksheet, so the macro simply caused the cell pointer to circle the worksheet 300 times. Our intent was to measure the speed with which each product moves the cell pointer from one cell to another when you press the cursor-movement keys. It's possible that our test measured only how quickly the macro processor moves the cell pointer.

7. Cell-Pointer Movement with Windows Off

We repeated the previous time trial, but we started the macro with the {WINDOWSOFF} and {PANELOFF} commands and ended the macro with the {WINDOWSON} and {PANELON} commands. The intent was to determine whether either product offers superior macro-processing speed when the display is frozen.

8. Macro No-Op

This test, which is similar to a fairly common time trial designed to measure a system's operating efficiency, sets the software working with no task to perform (hence, the term *no-op* for no operation). In this case, we created a macro that looped 5,000 times under the control of a {FOR} command. The loop was to a named cell that contained no macro commands. Consequently, the macro processor passed control from one command to another 5,000 times without performing any other task.

9. Project Schedule

The project-schedule worksheet appeared in the July 1987 @WORK column. You use the worksheet by running a macro that prompts you to enter information about when a project will begin and whether you will work on the project during weekends. Later you run a second macro that generates a table that shows the project schedule. We timed the second of the two macros because it performs its task without human intervention. By eliminating the data-entry portion of the macro, we ruled out introducing variability in the results by the user.

10. Loan Analysis
This worksheet appeared in the January 1987 @WORK column. It contained a data-entry area where you could record the principal, rate, and term of a loan. A short macro copied a collection of formulas to calculate principal and interest payments for each period. We timed the creation of the loan-payment schedule.

11. Graphs
Accurately comparing the speed with which the two releases display graphs was quite difficult. When you press a key, Release 3 immediately stops drawing a graph. Other releases of *1-2-3* finish plotting the graph and then process any pending keystrokes. You can time the performance of Release 2.2 by running a macro that presses the GRAPH key. While *1-2-3* is drawing the graph, you simply press a key. After the graph is drawn, the screen is immediately cleared and *1-2-3* records the elapsed time. If you try the same test in Release 3, plotting stops as soon as you press a key. Therefore, the results for Release 3 aren't comparable with those for Release 2.2. We created a graph that took several seconds to draw. Then we used a stopwatch to time the graph's completion from the moment we pressed the GRAPH key.

SELECTED TEST RESULTS

Two test areas that require additional commentary are automatic spreadsheet recalculation and macro processing. Two tests—Addition A and Addition B—evaluated automatic recalculation. Three tests—Cell-Pointer Movement, Cell-Pointer Movement with Windows Off, and Macro No-Op—assessed the speed of macro processing.

In the test called Addition A, Release 2.2, running under DOS, was more than three times faster than Release 3. However, Release 3 had a slight edge over Release 2.2 when we adjusted the test so that the spreadsheet had to update fewer than 700 of the 3,492 formulas.

In some runs of the Addition B test, the macro recorded an equal amount of elapsed time for both products running under both operating systems. In other runs, the elapsed time in Release 3 wasn't measurable. It was clear that Release 3's performance had improved when we decreased the number of formulas that relied on the changed value, while that of Release 2.2 had not.

Consequently, we repeated the test and used twice as many formulas in the worksheet. While the larger worksheet in Release 2.2 easily fit into RAM on the 80286, 1-megabyte system (mind you, Release 2.2 has access to only 640K of the total RAM), Release 3 could not retrieve the entire worksheet and, in fact, lost about 20 rows of formulas. That notwithstanding, Release 3 outcalculated Release 2.2. With the added formulas, Release 3's performance remained unchanged. However, Release 2.2's recalculation time doubled.

Similar tests in OS/2 showed that Release 3 took twice as long as Release 2.2 at the Addition A test. However, in both operating systems, Release 3 was immeasurably faster than Release 2.2 in the Addition B test.

Our conclusion is that if your worksheets are laden with formulas but the interrelationships between formulas are few, Release 3 will prove far faster than Release 2.2. However, if your formulas are heavily interrelated, Release 2.2 is likely to prove the faster product.

Release 3's slowness in handling @D functions is evident in the 1-Way Data Table test. To speed up an application that relies heavily on those functions, Lotus suggests using an alternative called an "aggregate column," which we'll discuss in an upcoming issue.

We had varying results with tests of the macro processor running under DOS. The macros that simply moved the cell pointer around the worksheet ran four times as fast in Release 3 as they did in Release 2.2 when the window display was active. With the window display inactive, Release 3 is two times as fast as Release 2.2—still a significant difference.

In OS/2, the difference increased. Release 3 became seven times as fast as Release 2.2 at moving the cell pointer with the windows active. It was two and a half times as fast when windows were off.

The Macro No-Op test painted a completely different picture. Release 2.2 performed the 5,000 macro loops in one-third the time that it took Release 3. Running the test in OS/2 did not improve Release 3's performance against that of Release 2.2.

The conclusion from these tests is that, regardless of the operating system, your macros will probably be more efficient in Release 3 if they rely heavily on commands that move the cell pointer, highlight ranges by pointing, and so on. Macros that leave the cell pointer in one place and rely heavily on advanced macro commands will probably run more efficiently in Release 2.2.

ABOUT THAT RAM

To determine how efficiently the two releases used RAM, we retrieved several worksheets in Releases 2.2 and 3. In each worksheet, we used the Worksheet Status command to determine how much of the total RAM was in use. The worksheets were identical on disk and contained identical cell entries and menu settings.

These RAM-usage comparisons showed that Release 3 requires on average 66% more RAM per entry than does Release 2.2. A 1K worksheet in Release 2.2 will use 1.66K in Release 3. Even when you use Release 2.2 with expanded memory, it uses far less RAM per entry than Release 3. If your hardware resources are limited, you'll be able to build much larger and probably much faster worksheets in Release 2.2 than you will in Release 3. ■

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Calculate Accelerated Depreciation

This worksheet and documentation take the mystery out of MACRS depreciation.

BY STEPHEN L. NELSON AND ALAN L. GRAY

The Modified Accelerated Cost-Recovery System (MACRS) is a set of rules and regulations for calculating asset depreciation for federal income taxes. MACRS calculations are complicated. However, *1-2-3* Release 3 provides a new financial function, @VDB, which lets you perform these calculations with ease.

This article describes a Release 3 worksheet you can use to calculate MACRS depreciation. If you use other versions of *1-2-3*, or if you use *Symphony* Release 2.0, we'll show you how to modify the worksheet to perform MACRS calculations with these programs as well.

MACRS depreciation methods apply to "real property" and to "tangible personal property" placed into service after December 31, 1986. Real property consists of land and things attached to land, such as buildings. Tangible personal property consists of physical objects, such as trucks, office equipment, or machine tools. The rules governing MACRS calculations are spelled out in Internal Revenue Service Publication 534, *Depreciation*, and are based on the Tax Reform Act of 1986. This publication is available from your local IRS office.

If you're not familiar with MACRS depreciation, read the next section before you build the worksheet. If you are familiar with MACRS depreciation conventions, build the worksheet now by following the instructions in the box on page 73. Then use the balance of this article as a guide to using the worksheet.

MAKE SENSE OF MACRS

The standard way to calculate MACRS depreciation requires three steps:

1. Assign each asset to a property class. There are eight classes of property based on the length of an asset's useful life. They are 3-year, 5-year, 7-year, 10-year, 15-year, 20-year, 27.5-year and 31.5-year. In order to determine the class of an asset, use the Table of Class Lives and Recovery

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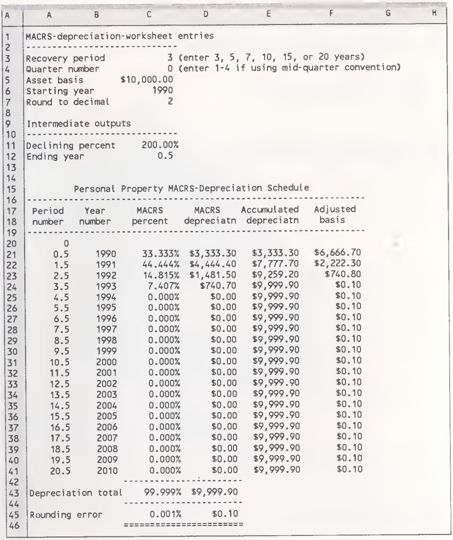
STEVE SPELMAN



```
A      A         B          C           D           E            F          G       H

1   MACRS-depreciation-worksheet entries
2   -----------------------------
3   Recovery period            3 (enter 3, 5, 7, 10, 15, or 20 years)
4   Quarter number             0 (enter 1-4 if using mid-quarter convention)
5   Asset basis       $10,000.00
6   Starting year           1990
7   Round to decimal           2
8
9   Intermediate outputs
10  -----------------------------
11  Declining percent    200.00%
12  Ending year              0.5
13
14
15          Personal Property MACRS-Depreciation Schedule
16  --------------------------------------------------------------------
17   Period    Year      MACRS       MACRS    Accumulated   Adjusted
18   number   number    percent   depreciatn  depreciatn     basis
19  --------------------------------------------------------------------
20        0
21      0.5     1990    33.333%   $3,333.30   $3,333.30   $6,666.70
22      1.5     1991    44.444%   $4,444.40   $7,777.70   $2,222.30
23      2.5     1992    14.815%   $1,481.50   $9,259.20     $740.80
24      3.5     1993     7.407%     $740.70   $9,999.90       $0.10
25      4.5     1994     0.000%       $0.00   $9,999.90       $0.10
26      5.5     1995     0.000%       $0.00   $9,999.90       $0.10
27      6.5     1996     0.000%       $0.00   $9,999.90       $0.10
28      7.5     1997     0.000%       $0.00   $9,999.90       $0.10
29      8.5     1998     0.000%       $0.00   $9,999.90       $0.10
30      9.5     1999     0.000%       $0.00   $9,999.90       $0.10
31     10.5     2000     0.000%       $0.00   $9,999.90       $0.10
32     11.5     2001     0.000%       $0.00   $9,999.90       $0.10
33     12.5     2002     0.000%       $0.00   $9,999.90       $0.10
34     13.5     2003     0.000%       $0.00   $9,999.90       $0.10
35     14.5     2004     0.000%       $0.00   $9,999.90       $0.10
36     15.5     2005     0.000%       $0.00   $9,999.90       $0.10
37     16.5     2006     0.000%       $0.00   $9,999.90       $0.10
38     17.5     2007     0.000%       $0.00   $9,999.90       $0.10
39     18.5     2008     0.000%       $0.00   $9,999.90       $0.10
40     19.5     2009     0.000%       $0.00   $9,999.90       $0.10
41     20.5     2010     0.000%       $0.00   $9,999.90       $0.10
42                     ----------------------
43  Depreciation total  99.999%   $9,999.90
44                     ----------------------
45  Rounding error       0.001%       $0.10
46                     ======================
```

FIGURE 1. In this MACRS-depreciation worksheet, you enter values in range C3..C7 that are used to calculate the depreciation schedule that begins in row 21. Here an asset with a 3-year recovery period is depreciated according to the midyear convention. Columns A through F of the schedule provide depreciation values on a year-by-year basis.

Periods in IRS Publication 534.

2. Make a note of the MACRS recovery period for each asset you have classified. If an asset doesn't match one of the descriptions in the table, it means the asset hasn't been assigned to a class life. In this case, consider the recovery period to be seven years.

3. Choose a depreciation-calculation method. You depreciate assets in the 3-, 5-, 7-, and 10-year classes by using the 200% declining-balance method. You depreciate assets in the 15- and 20-year classes by using the 150% declining-balance method. For assets in the 27.5- and 31.5-year classes, you depreciate using the straight-line method.

The 27.5-year and the 31.5-year classes are most often used for real estate. Because real estate uses the simpler, straight-line method, it isn't covered in this article.

DEALING WITH DECLINING BALANCE

There are some twists related to the calculations for declining-balance depreciation. These twists are the reason the @VDB function proves so handy.

Under either the 200% or the 150% declining-balance method, you switch from declining-balance to straight-line depreciation in the year when the straight-line method produces a larger depreciation expense. The @VDB function does this for you automatically.

In the declining-balance method, be mindful of two important conventions. The midyear and the mid-quarter conventions affect the amount of depreciation you calculate for the first year. Most of the time, you use the midyear convention. This means you calculate one half of a year's depreciation for the first year you use the asset.

However, if more than 40% of the assets you place into service during the tax year are placed into service during the last three months of the year, you must use the mid-quarter convention.

In figuring the percentage of assets placed into service during the last three months of the year, you exclude both residential rental property and nonresidential real property. You base this calculation on the cash-purchase price of each asset.

The mid-quarter convention lets you calculate depreciation from the middle of the quarter you place an asset into service until the end of the year. For example, for assets placed into service during the first quarter of the first year, you calculate 10.5 months of depreciation. You calculate 7.5 months of depreciation for assets placed into service during the second quarter, 4.5 months of depreciation for assets placed into service during the third quarter, and 1.5 months of depreciation for assets placed into service during the fourth quarter.

You might wonder why the worksheet does not perform the 40% determination for you and then plug the appropriate quarter number into the depreciation calculation. The reason is that it is not worth it to record on each worksheet the costs of all assets acquired during the year, as well as when those assets were acquired, in order to make a one-time calculation. That operation is more appropriate to a database than a spreadsheet.

1-2-3 Release 3 uses the @VDB function to calculate MACRS depreciation for the first six classes of assets. The @VDB function allows you to specify the declining-balance percent and automatically switches the depreciation method to straight-line when doing so results in a larger depreciation figure. The function also allows you to use the mid-quarter and midyear conventions to calculate the first year's depreciation.

THESE ARE THE ENTRIES

The worksheet in figure 1 requires the following five entries:

Cell C3: Here you enter the recovery period in years. It can be 3, 5, 7, 10, 15, or 20 years.

Cell C4: Here you enter zero if you're using the midyear convention or the number of the quarter if you're using the mid-quarter convention. If you use the mid-quarter convention, enter 1 to signify the first quarter, 2 to signify the second quarter, and so on. As noted earlier, you must use the mid-quarter convention when more than 40% of the assets you place into service during the year are placed in the last quarter.

Cell C5: Here you enter the "asset basis." This is the dollar value of the asset you are depreciating. For example, if an asset cost $10,000, you enter 10000 in cell C5. In MACRS calculations, you ignore salvage values. So even if the salvage value of the $10,000 asset is $1,000, you still enter 10000 in cell C5. Over the recovery period you will calculate a full $10,000 of depreciation. This procedure applies only to an asset used for business 100% of the time or only to the business portion of an asset.

Cell C6: Here you enter the year that you will begin depreciating the asset. This entry isn't required to calculate depreciation. It does, however, make the depreciation schedule easier to understand at a glance.

Cell C7: Enter 0 in this cell if you want the values in the depreciation schedule rounded to the nearest dollar. Enter 2 if you want the values rounded to the nearest penny.

INSIDE THE WORKSHEET

Two intermediate calculations precede the actual depreciation calculations. An @IF formula in cell C11 determines the declining-balance percent used by the @VDB function. If the asset class is 15 or 20, the declining-balance percent used is 150%. If the asset class is 3, 5, 7, or 10, the declining-balance percent is 200%.

A formula in cell C12 determines the portion of a full year's depreciation that should be taken the first year. If you've entered 0 in cell C4, the worksheet assumes you want to use the midyear convention, which means that one half, or 0.5, of a year's depreciation should be calculated for the first year. If you enter a quarter number in cell C4, the worksheet assumes you want to use the mid-quarter convention, with the first year's depreciation starting in the middle of the quarter whose number you've entered.

For example, when 1 is entered in cell C4, the worksheet calculates depreciation for 10.5 months of the first year. This means you want to take 10.5/12, or 0.875, of a full year's depreciation the first year.

THE DEPRECIATION SCHEDULE

Actual depreciation figures are calculated in range A20..F41. Column A contains the start and end numbers used in the @VDB function.

Column B shows the year numbers, beginning with the first year for which depreciation is calculated.

The heart of the worksheet consists of the MACRS formulas in column C. These formulas return percentages equal to the MACRS percentages found in tables provided by the Internal Revenue Service. These formulas have three segments: an @IF segment, an @ROUND segment, and an @VDB segment.

The @IF segment determines if the year for which depreciation is calculated is completely outside the recovery period. If it is, the formula returns 0. You need to check this because the @VDB function returns ERR if you try to calculate the tenth year's depreciation for an asset with a 7-year recovery period.

The @ROUND segment rounds the result of the MACRS percentage calculation to five decimal places. The MACRS depreciation rates in the IRS table shown in figure 2 are rounded to four decimal places for assets in the 3-, 5-, 7-, 10-, and 15-year classes and five decimal places for assets in the 20-year class. These figures are expressed as percentages in figure 2.

The @VDB function is used in this example to return an equivalent percentage rather than a dollar amount for depreciation. This is because we use 1, rather than the cost of the asset, for the *cost* argument. Using 1 forces the function to return either the percent of the cost you can take in depreciation or the total cost.

Column D returns the dollar amount of depreciation for the year. The worksheet calculates this amount by multiplying the MACRS percent in column C by the asset basis, or cost, in cell C5.

Column E returns the accumulated depreciation through the current year. Formulas in this column sum the range that contains the yearly depreciation amounts from the beginning of the recovery period through the current year.

Column F returns the asset's "adjusted basis," or net book value. This is equal to the original cost in cell C5 minus the accumulated depreciation. In some cases, such things as improvements and casualty losses can change the basis.

MEET THE @VDB FUNCTION

This function, available only in *1-2-3* Release 3, takes seven arguments. It looks like this:

@VDB(*cost,salvage,life,start_period,end_period,
depreciation_factor,switch*)

The first three arguments—*cost*, *salvage*, and *life*—will be familiar to you if you've used any of the *1-2-3* depreciation functions. *Cost* represents the cost of the asset that you are depreciating. However, as mentioned earlier, in this example the @VDB function returns the depreciation percentage rather than the amount.

Salvage represents the value of the asset at the end of its life. In the example, *salvage* is 0 because MACRS depreciation conventions ignore salvage values.

Life represents the number of periods it will take to depreciate the asset to its salvage value. In the example, *life* equals the recovery period you enter in cell C3.

The true power of the @VDB function resides in the last four arguments. They are: *start_period*, *end_period*, *depreciation_factor*, and *switch*.

Start_period and *end_period* correspond to an asset's life relative to the fiscal period. These arguments let you specify not only the year for which depreciation should be calculated but also the first year's depreciation using the midyear or mid-quarter convention.

For example, if *start_period* equals 0 and *end_period* equals 0.5, @VDB calculates the first year's depreciation as equal to one-half year of depreciation, which is, in effect, the application of the midyear convention. Similarly, if *start_period* equals 0 and *end_period* equals 10.5 divided by 12, or 0.875, @VDB calculates the first year's depreciation for 10.5 months by using the mid-quarter convention.

Depreciation_factor is optional. It lets you specify the percentage for straight-line depreciation. In this MACRS example, @VDB refers to the percent for the declining balance that was calculated in cell C11. This equals either 1.5 (150%) or 2 (200%). If you omit *depreciation_factor*, @VDB calculates 200% of the declining balance.

Switch is also an optional argument. If you leave it out or set it to 0, @VDB switches to straight-line depreciation in the year that it produces a larger figure than declining-balance depreciation set. If you set *switch* to 1, @VDB doesn't switch to the straight-line method. In the example, we've left out *switch*.

AND IN OTHER RELEASES

If you use a Lotus spreadsheet other than *1-2-3* Release 3, you'll need to modify this worksheet. Replace the formulas that calculate MACRS percentages in column D with percentages from the IRS tables. This approach makes more sense than going to the effort required to construct cumbersome formulas to duplicate the @VDB function.

For example, to calculate MACRS depreciation for an asset with a 3-year recovery period under the midyear convention, replace the formulas in column C with the appropriate entries from the IRS tables. Enter 33.33% in cell C21, 44.45% in cell C22, 14.81% in cell C23, and 7.41% in cell C24. It's as simple as that.

Most of the time, you'll probably use the midyear convention. When that's the case, refer to the table in figure 2 for all your percentage values. If you need other MACRS percentages, such as those used in the mid-quarter convention, use the tables supplied in IRS Publication 534. The table in figure 2 is based on IRS figures. For your own calculations, be sure to use the latest edition of the publication.

If the Recovery Year is:	and the Recovery Period is:					
	3-year	5-year	7-year	10-year	15-year	20-year
	the Depreciation Rate is:					
1	33.33	20.00	14.29	10.00	5.00	3.750
2	44.45	32.00	24.49	18.00	9.50	7.219
3	14.81	19.20	17.49	14.40	8.55	6.677
4	7.41	11.52	12.49	11.52	7.70	6.177
5		11.52	8.93	9.22	6.93	5.713
6		5.76	8.92	7.37	6.23	5.285
7			8.93	6.55	5.90	4.888
8			4.46	6.55	5.90	4.522
9				6.56	5.91	4.462
10				6.55	5.90	4.461
11				3.28	5.91	4.462
12					5.90	4.461
13					5.91	4.462
14					5.90	4.461
15					5.91	4.462
16					2.95	4.461
17						4.462
18						4.461
19						4.462
20						4.461
21						2.231

FIGURE 2. This is one of several percentage tables for MACRS depreciation found in the 1988 IRS Publication 534, *Depreciation*. This table applies to the MACRS midyear convention. If the rounded percentages in the worksheet differ significantly from the IRS percentages, or if you are using a program other than *1-2-3* Release 3, you must replace the formulas in column C of the worksheet with percentages from the IRS tables.

EXPANDING THE CONCEPT IN RELEASE 3

The depreciation worksheet described here is fine as far as it goes. It enables you to perform MACRS calculations on an asset-by-asset basis. By exploiting the 3-D features of Release 3, however, you can use this worksheet as the foundation of a MACRS depreciation system in which each asset or class of assets is represented by an individual worksheet within a stack of worksheets.

Here's how to go about creating a 3-D depreciation model. After building the worksheet we've already described, add a sheet for each depreciation schedule you need. (See the article on page 52 for specifics on creating 3-D worksheets.)

Next, copy the MACRS depreciation schedule on sheet A to the additional sheets. As long as you position the depreciation schedules in the same place on each sheet, you can summarize MACRS asset-depreciation amounts by summing ranges. For example, if you are using three worksheets—A, B, and C—you can calculate the total basis of all assets with the formula @SUM(A:C5..C:C5).

Similarly, you can summarize the depreciation for the first year with the formula @SUM(A:E21..C:E21). If you want, you can add an extra worksheet to summarize key amounts from the individual worksheets.

CAVEATS TO KEEP IN MIND

You need to keep several of the model's limitations in mind when you use it. First, there may be a difference between the rounded percentages that @VDB calculates and those the IRS publishes in its tables. This is true even though the @VDB formula is rounded to a precision of five decimal places. The differences are due to the way the IRS builds its schedules. To duplicate the algorithm the IRS uses would require an extraordinarily complex formula.

How can you identify differences in rounded percentages? The formula in cell C43 adds MACRS percentages in column C. The result the cell returns should be 100.000%. If it is not, the difference is returned by the formula in cell C45, shown in dollars and cents in cell D45.

If the difference amounts to pennies, as it does in this example, you don't need to worry about it. If you are depreciating a much larger asset, however, the difference between the rounded percentages could add up to a large amount of money. For this reason, it's wise to track the difference with this worksheet.

Seek the advice of a tax specialist if you suspect that a difference is large enough to merit adjustment. If you find that you need to make adjustments, replace the percentages the @VDB function calculates with those taken from the MACRS schedule prepared by the IRS.

Second, if your tax year is less than 12 full months, you must make additional calculations. These calculations limit the amount of depreciation you can take under MACRS conventions. You may want to consult your tax advisor for help with this situation as well.

The third and final caveat is that this model doesn't address all the IRS MACRS categories. For instance, it does not address what the IRS calls "listed property." Listed property includes automobiles, computers, and printers that are not used solely for business, and personal property that's used for entertainment, recreation, and amusement. Nor does the model address straight-line depreciation or class-life depreciation. For these cases, you may want to consult a tax advisor. ■

HOW TO SET UP THE MACRS-DEPRECIATION WORKSHEET

1. Releases

This worksheet runs in *1-2-3* Release 3 and, with modification, in Releases 2/2.01 and 2.2, and in *Symphony* 2.0. Unless otherwise specified, instructions work in all releases of *1-2-3*.

2. Column widths

In *1-2-3* Releases 2.2 and 3, select /Worksheet Column Column-Range Set-Width, enter C1..F1, specify 12.

In other releases set the column widths as follows:

Column	Width
C	12
D	12
E	12
F	12

For example, to set the width of column C, position the cell pointer in column C and select

1-2-3: /Worksheet Column Set-Width, enter 12

Symph: MENU Width Set, enter 12

3. Cell formats

Format	Cell
Currency 2	C5, D21..F41, D43..D45
Percent 2 (*Symph*: % 2)	C11
Percent 3 (*Symph*: % 3)	C21..C45

For example, to assign the format to cell C5, select

1-2-3: /Range Format Currency, press Return to accept the default of 2, indicate cell C5.

Symph: MENU Format Currency, press Return to accept the default of 2, indicate cell C5.

4. Labels

Enter the labels shown in figure 1. To create the dashes and double dashes enter \- or \= in the appropriate cells and copy this entry as necessary. Center the labels in range A17..F18.

1-2-3: /Range Label Center

Symph: MENU Range Label-Alignment Center

5. Values

Enter the values shown in range C3..C7. Enter 0 in cell A20.

6. Formulas

Cell	Formula
C11	@IF($C$3>=15,1.5,2)
C12	@IF(C4=0,0.5,0)+@IF(C4=1,10.5/12,0)+@IF(C4=2,7.5/12,0)+@IF(C4=3,4.5/12,0)+@IF(C4=4,1.5/12,0)
A21	+C12
A22	+A21+1
B21	+C6
B22	+B21+1
C21	@IF(A20>$C$3#AND#A21>$C$3,0,@ROUND(@VDB(1,0,$C$3,A20,A21,$C$11),5))

Note: In *Symphony* Release 2.0 and *1-2-3* Releases 2/2.01 and 2.2, you will need to enter the actual MACRS percentages using the IRS prepared tables in place of the formulas that calculate the MACRS percentages in column C. Figure 2 shows the percentages to use for the midyear convention.

D21	@ROUND(C21*$C$5,$C$7)
E21	@SUM($D$21..D21)
F21	$C$5-E21

Copy range A22..B22 to range A23..B41. In *Symphony* Release 2.0 and *1-2-3* Releases 2/2.01 and 2.2, copy range D21..F21 to range D22..F41. In *1-2-3* Release 3, copy range C21..F21 to range C22..F41.

C43	@SUM(C19..C42)
C45	1-C43
D43	@SUM(D19..D42)
D45	+C5-D43

HOW TO PREDICT SEASONAL

BY EVERETTE S. GARDNER JR.

Regular seasonal patterns appear in most business data. The weather affects sales of everything from snorkeling gear to snowmobiles. During the December holiday season there are increases in long-distance telephone calls, sales of greeting cards, and gasoline consumption. Management policy can also cause seasonal patterns in sales: Some companies run annual sales promotions; others shut down for annual vacation periods.

Unless you adjust your data for seasonality—that is, remove the seasonal pattern—it's difficult to analyze period-to-period changes or make reliable projections of growth or trends. For example, you may mistake a change in a trend for a change in a seasonal pattern. You can perform adjustments easily by using the worksheet described in this article. It runs in *1-2-3* Releases 2.01 and higher and in *Symphony* Release 2.0.

If you have any doubts about the seasonality of your business data, you should consider two things. First, are the peaks and troughs consistent? That is, do the high and low points of the pattern occur at about the same periods each year? Second, is there some reasonable explanation, such as weather, holidays, or corporate policy, for a seasonal pattern?

If the answer to either of these questions is no, I recommend that you avoid seasonal adjustment. But if the answer to both questions is yes, you're probably looking at seasonality.

TYPES OF SEASONAL PATTERNS

We encounter two types of seasonal patterns in business data. The first is called multiplicative seasonality. With this pattern, a general trend of increased sales is coupled with increasing distances between peaks and troughs. Figure 1

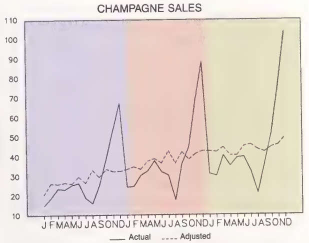


FIGURE 1. The solid line shows actual champagne sales over three years. Notice the peaks that occur around December. The broken line shows the data for the same period after being adjusted for multiplicative seasonality to negate the effect of the seasonal cycle. It's easier to see the year-to-year trend in the broken line than in the solid line.

Everette S. Gardner Jr. is a professor of decision and information sciences at the University of Houston and author of AUTOCAST II, *a business-forecasting system for PC users.*

PATTERNS

To see if there really is a trend in your sales, filter out the effects of the yearly cycle.

illustrates a multiplicative seasonal pattern in monthly sales from 1962 through 1964 of a private-label brand of French champagne. The solid line represents actual data.

Each year, sales peak in December and fall to a trough, or low point, in August. Notice that each year the range from peak to trough grows substantially. The broken line shows seasonally adjusted data. It's much easier to see the year-to-year trend looking at this line.

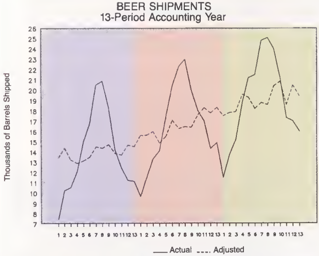


FIGURE 2. The solid line shows beer shipments over three years and reveals that sales peak during the summer months. The broken line plots the adjusted sales data computed with the additive approach and reveals the upward trend in beer shipments.

The second type of seasonal pattern is called additive. Here, the range of seasonal fluctuation each year is constant. Figure 2 illustrates additive seasonality in beer shipments for a Texas brewery from 1986 through 1988. The brewery's accounting system is based on 13 four-week periods per year. As you would expect, shipments peak during the summer, around period 8. The trough period for beer shipments occurs in midwinter at period 1. During all three years, the range of peak-to-trough values is quite stable, so we choose a forecast that assumes additive seasonality.

Multiplicative seasonal patterns are more common than additive patterns, but don't rule out the possibility of additive patterns. If you're in doubt about the type of seasonality in your data, compare the results of the models' adjustments for both patterns. These models are particularly easy to use in spreadsheet form.

MULTIPLICATIVE SEASONAL ADJUSTMENT

Multiplicative seasonal adjustment computes a seasonal index for each period of a fiscal year. The indices let you compute a set of adjusted values by dividing actual sales for each period by the index for its period.

An explanation of the worksheet in figure 3 (on the next page) follows. To build the worksheet, complete the setup instructions in the box on the page opposite the figure. The worksheet uses five steps to compute indices and adjust data for multiplicative seasonality.

Step 1. Compute and center a moving average. A mov-

EARL KELENY

ing average, unlike a running average, always covers a set number of periods. Here, each moving average covers a year. The group of periods that is averaged changes from one period to another. For instance, in a monthly accounting system, the average for July through June generally differs from the average for August through July.

In the worksheet, the moving averages for the data in column D are calculated in column E. The first moving average, 29.4, is the average of the data for January through December 1962. It's entered opposite July 1962, because the first average is always placed as close as possible to the middle period (generally considered to be month 7 with monthly data) of the first year of the data. This is called centering the moving average.

The second average, 30.1, covers February 1962 through January 1963 and is placed opposite August 1962. The third average, 30.7, covers March 1962 through February 1963 and is placed opposite September 1962. And so it goes. Since values beyond December 1964 are not available, you do not enter formulas for moving averages after July 1964.

If n stands for the number of periods and x for periods per year, there will be $n-(x-1)$ moving averages. For instance, with monthly data there will be $n-11$ moving averages, while with quarterly data there will be $n-3$ moving averages. When a year is divided into 13 accounting periods, there will be $n-12$ moving averages.

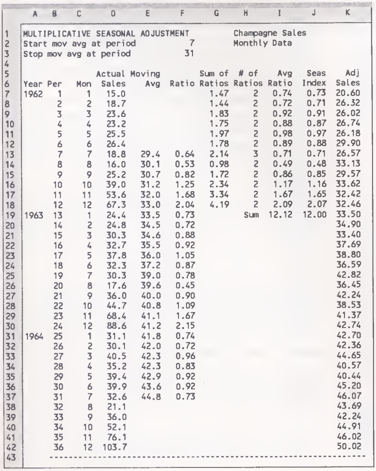
You can use cell F2 to force some of the moving-average formulas to return 0. If you want to use only part of the data you've entered in the worksheet, change the value in this cell. For example, you may decide that the first year of your data is not a representative sample and should not be used in forecasting. In that case, you could start the moving averages in the middle of the second year of the data by entering **19** in cell F2. Cell F3 returns the value of the final period included in the final moving-average formula.

Step 2. Compute ratios of actual sales to moving averages. The formulas in column F compute ratios by dividing sales values in column D by their corresponding moving averages in column E. (You should have as many formulas for ratios as formulas for moving averages.) These ratios are the preliminary seasonal indices. Because the moving averages cover an entire year, the ratios are free of seasonality.

Step 3. Compute average ratios. You need to find the average of the ratios, because ratios for corresponding periods in successive years generally differ somewhat. The formulas in column G add the ratios. The first formula, in cell G7, returns the sum of January ratios. The second formula, in cell G8, returns the sum of February ratios, and so on.

The formulas in column H indicate the number of ratios summed by the adjacent formulas in column G. The count will change, depending on when your data starts and stops. Here, there are only two January ratios to sum, so the formula in cell H7 returns 2. Likewise, there are only two December ratios, so the formula in cell H18 returns 2. The only month that has ratios from all three years is July, so cell H13 returns 3.

Column I computes average ratios by dividing the sum of ratios for each period by the number of ratios for each period. The average ratios in column I compare sales in a given period with



```
      A    B     C      D       E       F      G      H      I      J      K

1   MULTIPLICATIVE SEASONAL ADJUSTMENT          Champagne Sales
2   Start mov avg at period          7          Monthly Data
3   Stop mov avg at period          31
4
5                   Actual Moving         Sum of  # of    Avg   Seas    Adj
6   Year Per   Mon  Sales     Avg  Ratio Ratios Ratios Ratio  Index  Sales
7   1962   1     1   15.0                  1.47      2  0.74   0.73  20.60
8          2     2   18.7                  1.44      2  0.72   0.71  26.32
9          3     3   23.6                  1.83      2  0.92   0.91  26.02
10         4     4   23.2                  1.75      2  0.88   0.87  26.74
11         5     5   25.5                  1.97      2  0.98   0.97  26.18
12         6     6   26.4                  1.78      2  0.89   0.88  29.90
13         7     7   18.8    29.4   0.64   2.14      3  0.71   0.71  26.57
14         8     8   16.0    30.1   0.53   0.98      2  0.49   0.48  33.13
15         9     9   25.2    30.7   0.82   1.72      2  0.86   0.85  29.57
16        10    10   39.0    31.2   1.25   2.34      2  1.17   1.16  33.62
17        11    11   53.6    32.0   1.68   3.34      2  1.67   1.65  32.42
18        12    12   67.3    33.0   2.04   4.19      2  2.09   2.07  32.46
19  1963  13     1   24.4    33.5   0.73           Sum 12.12  12.00  33.50
20        14     2   24.8    34.5   0.72                             34.90
21        15     3   30.3    34.6   0.88                             33.40
22        16     4   32.7    35.5   0.92                             37.69
23        17     5   37.8    36.0   1.05                             38.80
24        18     6   32.3    37.2   0.87                             36.59
25        19     7   30.3    39.0   0.78                             42.82
26        20     8   17.6    39.6   0.45                             36.45
27        21     9   36.0    40.0   0.90                             42.24
28        22    10   44.7    40.8   1.09                             38.53
29        23    11   68.4    41.1   1.67                             41.37
30        24    12   88.6    41.2   2.15                             42.74
31  1964  25     1   31.1    41.8   0.74                             42.70
32        26     2   30.1    42.0   0.72                             42.36
33        27     3   40.5    42.3   0.96                             44.65
34        28     4   35.2    42.3   0.83                             40.57
35        29     5   39.4    42.9   0.92                             40.44
36        30     6   39.9    43.6   0.92                             45.20
37        31     7   32.6    44.8   0.73                             46.07
38        32     8   21.1                                            43.69
39        33     9   36.0                                            42.24
40        34    10   52.1                                            44.91
41        35    11   76.1                                            46.02
42        36    12  103.7                                            50.02
43        ------------------------------------------------------------------
```

FIGURE 3. In this worksheet actual champagne sales (range D7..D42) are adjusted for additive seasonality (range K7..K42). Formulas in range E13..E37 compute moving averages. Formulas in range F13..F37 divide each month's actual sales by its centered moving average. Formulas in range G7..I18 return the averages of the January ratios, February ratios, and so on. Formulas in range J7..J18 compute a set of seasonal indices for each month by multiplying each average ratio by the quotient of 12 divided by the total of the average ratios. Finally, the formulas in column K give each adjusted sales value by dividing the actual sales value in column D by its seasonal index.

monthly average sales. Cell I7, for instance, indicates that sales in January tend to be 74% of average monthly sales. And sales in December tend to be 209% of average sales.

Step 4. Normalize the ratios. The average ratios should add up to 12, because there are 12 months in the year. But, because of rounding errors in steps 1 through 3, the average ratios sum to 12.12. The formulas in column J normalize, or adjust, the ratios so that they sum to the number of periods in a year. This is done by multiplying each average ratio by a normalization factor, which is the number of periods in a year divided by the sum of the average ratios. In the example in figure 3, the normalization factor is 12 divided by 12.12.

Step 5. Adjust the data. The final step is to produce values for adjusted sales. This is the data that was plotted as a broken line on the graph in figure 1.

Column K divides the actual sales for each period by the seasonal index for each period. There are 36 actual values and only 12 indices. We use the @INDEX function so that each sales value that's next to a 1 in column C is divided by the first seasonal index. And each sales value that's next to a 2 is divided by the second seasonal index, and so on.

ADDITIVE SEASONAL ADJUSTMENT

In additive seasonal adjustment, the seasonal indices measure the difference between sales for a specific period and the year's average sales. You compute adjusted values by subtracting the indices from actual sales. Figure 4 (on the next page) shows a worksheet that makes additive adjustments for three years of shipments.

The steps for computing additive indices are similar to those for the multiplicative indices. The only changes are:

- Column F returns the differences between a period's sales and moving averages. Column I computes average differences rather than average ratios.
- Column J normalizes the average differences by dividing the sum of the average differences by the number of periods in a year and then subtracting that answer from the adjacent average difference.
- Column K adjusts sales values by subtracting the seasonal index from the sales for a period.

MODIFYING THE WORKSHEETS

If your business tracks sales monthly and the multiplicative approach is applicable to your data, you can use the first worksheet more or less as it is. Likewise for the sec-

HOW TO SET UP THE WORKSHEET FOR MULTIPLICATIVE SEASONAL ADJUSTMENT

1. Releases

The worksheet runs in *1-2-3* Releases 2.01, 2.2, and 3 and in *Symphony* Release 2.0.

2. Default settings

Recalculation: Manual

1-2-3: /Worksheet Global Recalculation Manual
Symph: MENU Settings Recalculation Method Manual Quit

Column width: 7

1-2-3: /Worksheet Global Column-Width, enter 7
Symph: MENU Settings Width, enter 7, select Quit

Format: Fixed 2

1-2-3: /Worksheet Global Format Fixed, press Return
Symph: MENU Settings Format Fixed, press Return, select Quit

3. Individual column widths

A, B, and C: 5

Place the cell pointer in column A and select

1-2-3 Rel. 2.01: /Worksheet Column Set-Width, enter 5

Repeat with the cell pointer in column B and then C.

1-2-3 Rel. 2.2 and 3: /Worksheet Column Column-Range Set-Width, specify range A1..C1, enter 5
Symph: MENU Width Set, enter 5

Repeat with the cell pointer in column B and then C.

4. Cell formats

Format	Range
General	F2..F3, A7..C42, H7..H18
Fixed 1	D7..E42
Fixed 2	F13..F37

For example, to set the width of range F2..F3, select

1-2-3: /Range Format General, specify range F2..F3
Symph: MENU Format General, specify range F2..F3

5. Labels

Enter all the labels shown in figure 3, including the label "*Sum* in cell H19. Begin the label in cell H5 with an apostrophe. To right-align the labels in rows 5 and 6, select /Range Label Right (*Symph*: MENU Range Label-Alignment Right) and specify range A5..K6. Enter \– in cell B43 and copy cell B43 to range C43..K43.

6. Values

Enter the values shown in figure 3 in cells F2, A7, A19, and A31. To enter the period numbers, select /Data Fill (*Symph:* MENU Range Fill), specify range B7..B42 as the Fill range, enter *1* as the Start value and press Return twice to accept the default Step and Stop values. Copy range B7..B18 to cells C7, C19, and C31. Then enter the values shown in range D7..D42.

7. Formulas

Cell	Formula
F3	@COUNT(D7..D43) – 6
E13	@IF(B13<$F$2#OR#B13>$F$3,0, @AVG(D7..D18))
F13	@IF(E13=0,0,D13/E13)

Copy range E13..F13 to range E14..E37.

Cell	Formula
G7	+F7+F19+F31
H7	(F7<>0)+(F19<>0)+(F31<>0)
I7	+G7/H7

Copy range G7..I7 to range G8..G18.

Cell	Formula
I19	@SUM(I7..I18)
J7	+I7*(12/$I$19)

Copy cell J7 to range J8..J18. Copy cell I19 to cell J19.

Cell	Formula
K7	+D7/@INDEX(J$7..J$18,0,C7 – 1)

Copy cell K7 to range K8..K42.

Save the worksheet.

ond worksheet, if you use a 13-period year and the additive approach is called for. But you may want to use more than three years of data.

If you want to add more periods to the worksheet, move the cell pointer to the row containing the line of dashes. It's line 43 in figure 3 and line 46 in figure 4. Insert as many more rows as you need. Add years in column A, extend the run of numbers in column B, add accounting periods in column C, and enter additional sales values in column D.

Assign the General format to the new entries in columns A, B, and C. If you're using the multiplicative approach, assign the Fixed 1 format to the new data in column D and then press CALC. Cell F3 now tells you which period has the last moving average. Copy the final moving-average formula in column E and the final ratio or difference formula in column F to the range ending at the period indicated by cell F3.

Next, change the formulas that add the ratios or differences. These formulas must contain a cell reference for every year of data. For example, if you add another period to the multiplicative worksheet, the formula in cell G7 is changed to +F7+F19+F31+F43. Change the formulas for the number of ratios or number of differences in the same way. When you add a year to a worksheet based on monthly data, the formula in cell H7 changes to:

(F7<>0)+(F19<>0)+(F31<>0)+(F43<>0)

Copy the adjusted formulas in cells G7 and H7 as far down their columns as necessary.

Finally, copy the last adjusted-sales formula in column K so that these formulas extend to the row above the dashed lines.

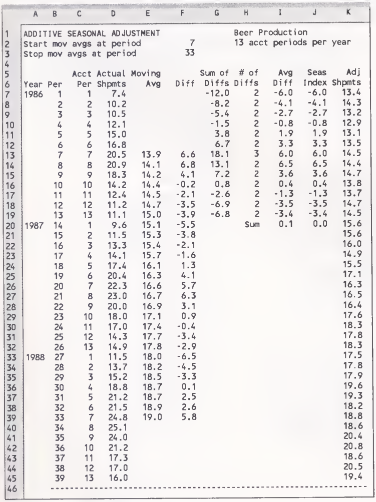
If you can't use either type of combination we provided in our worksheets (monthly data for multiplicative adjustments or 13-period data for additive adjustments), modify the appropriate model for the number of periods your company does use. First enter years in the correct positions in column A: in every fourth cell for quarterly data, in every twelfth cell for monthly data, and so on. Then enter an appropriate label as the heading for column C. Enter the appropriate series of numbers below the heading, such as 1 through 4 or 1 through 12. Next, insert or delete rows as necessary. Don't delete the row of dashes.

Change the value in cell F2 to the number of the middle period of the first year (or the period after the middle if there's an even number of periods). Then look at the formula in cell F3. The range for the @COUNT expression must extend from the first actual sales value to the cell containing the dashes. This lets you insert or delete rows without corrupting the formula. The value after the minus sign must be half the number of periods in a year, rounded off. For quarterly data this value is 2; for monthly data, 6; and for 13-period data, 7.

Change the formulas for moving averages. These formulas must start at the period indicated in cell F2. The @AVG expressions must use ranges that reflect one year of data. With quarterly data, for example, you'd enter the following:

Cell	**Formula**
E9	@IF(B9<$F$2#OR#B9>$F$3,0, @AVG(D7..D10))
F9	@IF(E9=0,0,D9/E9)

Then copy range E9..F9 to the range extending from cell E10 to the row indicated by the formula in cell F3.



```
     A    B    C      D      E      F      G     H      I      J      K

1   ADDITIVE SEASONAL ADJUSTMENT                Beer Production
2   Start mov avgs at period            7       13 acct periods per year
3   Stop mov avgs at period            33
4
5             Acct Actual Moving           Sum of  # of    Avg   Seas    Adj
6   Year Per   Per Shpmts    Avg    Diff   Diffs Diffs   Diff  Index Shpmts
7   1986   1     1    7.4                  -12.0     2   -6.0   -6.0   13.4
8          2     2   10.2                   -8.2     2   -4.1   -4.1   14.3
9          3     3   10.5                   -5.4     2   -2.7   -2.7   13.2
10         4     4   12.1                   -1.5     2   -0.8   -0.8   12.9
11         5     5   15.0                    3.8     2    1.9    1.9   13.1
12         6     6   16.8                    6.7     2    3.3    3.3   13.5
13         7     7   20.5   13.9     6.6    18.1     3    6.0    6.0   14.5
14         8     8   20.9   14.1     6.8    13.1     2    6.5    6.5   14.4
15         9     9   18.3   14.2     4.1     7.2     2    3.6    3.6   14.7
16        10    10   14.2   14.4    -0.2     0.8     2    0.4    0.4   13.8
17        11    11   12.4   14.5    -2.1    -2.6     2   -1.3   -1.3   13.7
18        12    12   11.2   14.7    -3.5    -6.9     2   -3.5   -3.5   14.7
19        13    13   11.1   15.0    -3.9    -6.8     2   -3.4   -3.4   14.5
20  1987  14     1    9.6   15.1    -5.5           Sum    0.1    0.0   15.6
21        15     2   11.5   15.3    -3.8                               15.6
22        16     3   13.3   15.4    -2.1                               16.0
23        17     4   14.1   15.7    -1.6                               14.9
24        18     5   17.4   16.1     1.3                               15.5
25        19     6   20.4   16.3     4.1                               17.1
26        20     7   22.3   16.6     5.7                               16.3
27        21     8   23.0   16.7     6.3                               16.5
28        22     9   20.0   16.9     3.1                               16.4
29        23    10   18.0   17.1     0.9                               17.6
30        24    11   17.0   17.4    -0.4                               18.3
31        25    12   14.3   17.7    -3.4                               17.8
32        26    13   14.9   17.8    -2.9                               18.3
33  1988  27     1   11.5   18.0    -6.5                               17.5
34        28     2   13.7   18.2    -4.5                               17.8
35        29     3   15.2   18.5    -3.3                               17.9
36        30     4   18.8   18.7     0.1                               19.6
37        31     5   21.2   18.7     2.5                               19.3
38        32     6   21.5   18.9     2.6                               18.2
39        33     7   24.8   19.0     5.8                               18.8
40        34     8   25.1                                              18.6
41        35     9   24.0                                              20.4
42        36    10   21.2                                              20.8
43        37    11   17.3                                              18.6
44        38    12   17.0                                              20.5
45        39    13   16.0                                              19.4
46        ------------------------------------------------------------------
```

FIGURE 4. In this worksheet actual beer shipments (range D7..D45) are adjusted for additive seasonality (range K7..K45). The formulas are similar to those in the multiplicative worksheet. The differences are that the formulas in column F compute the difference between each sales value and its moving average, that each formula in column J divides the total of the average differences by 13 and subtracts the result from the adjacent value in column I, and that each formula in column K subtracts the seasonal index for the appropriate accounting period from the corresponding sales value in column D.

The sum-of-ratios or sum-of-differences formulas in column G and the number-of-ratios or number-of-differences formulas in column H must refer to every *n*th cell in column F, where *n* is the number of periods in a year. If you're using three years of quarterly data, use the formulas +F7+F11+F15 and (F7<>0)+(F11<>0)+(F15<>0) in cells G7 and H7, respectively. For more than three years of data, add the appropriate cell references to these formulas. Then copy them in their respective columns as needed. The worksheet should have as many formulas for sums of ratios or sums of differences as there are periods in a year.

You don't need to change the average-ratio or average-difference formulas in column I. But you need as many of these formulas as there are periods in a year. Be sure there's an @SUM formula immediately below the average-ratio or average-difference formulas that refers to the appropriate range. For example, for quarterly data you'd enter @SUM(I7..I10) in cell I11. The result of this formula should be close to the number of periods per year in the multiplicative model or close to 0 in the additive model.

Use only as many seasonal-index formulas as there are periods in a year. The first expression inside the parentheses must be the number of periods in the year. The second expression is the address of the formula that totals the seasonal indices. Remember to use dollar signs to make absolute the reference to that formula. It's not strictly necessary to enter a formula that sums the seasonal indices, but doing so helps you detect problems with the other formulas. In the multiplicative model, the sum of the seasonal indices exactly equals the number of periods in a year. In the additive formula, the sum of the seasonal indices exactly equals zero.

These guidelines assume that you're using at least three years of data. As with all forecasting models, the more actual information you start with, the more accurate the forecast. You must have at least two complete cycles of data for a seasonal adjustment to work. Thus you need at least 8 quarters, 24 months, or, if you use 13 accounting periods per year, 26 periods.

If you want to use data for two years instead of three, you can delete the rows used for the third year and adjust the formulas in columns G and H. However, in the long-run it is probably easier to erase the data and the data-adjusted formulas for the third year. That would make it easier to use data for three years later on. ■

HOW TO SET UP THE WORKSHEET FOR ADDITIVE SEASONAL ADJUSTMENT

1. Releases

The worksheet runs in *1-2-3* Releases 2.01, 2.2, and 3 and in *Symphony* Release 2.0.

2. Default settings

Recalculation: Manual

1-2-3: /Worksheet Global Recalculation Manual
Symph: MENU Settings Recalculation Method Manual Quit

Column width: 7

1-2-3: /Worksheet Global Column-Width, enter 7
Symph: MENU Settings Width, enter 7, select Quit

Format: Fixed 1

1-2-3: /Worksheet Global Format Fixed, enter 1
Symph: MENU Settings Format Fixed, enter 1, select Quit

3. Individual column widths

A, B, and C: 5

Place the cell pointer in column A and select

1-2-3 Rel. 2.01: /Worksheet Column Set-Width, enter 5

Repeat with the cell pointer in column B and then C.

1-2-3 Rel. 2.2 and 3: /Worksheet Column Column-Range Set-Width, specify range A1..C1, enter 5
Symph: MENU Width Set, enter 5

Repeat with the cell pointer in column B and then C.

4. Cell formats

Format	Range
General:	F2..F3, A7..C45, H7..H19

For example, to set the width of range F2..F3, select

1-2-3: /Range Format General, specify range F2..F3
Symph: MENU Format General, specify range F2..F3

5. Labels

Enter all the labels shown in figure 4, including the label *"Sum* in cell H20. Begin the labels in cells H2 and H5 with apostrophes. Right-align the labels in rows 5 and 6: Select /Range Label Right (*Symph*: MENU Range Label-Alignment Right) and specify range A5..K6. Enter \– in cell B46 and copy cell B46 to range C46..K46.

6. Values

Enter the values shown in figure 3 in cells F2, A7, A20, and A33. To enter the period numbers, select /Data Fill (*Symph*: MENU Range Fill), specify range B7..B45 as the Fill range, enter *1* as the start value and press Return twice to accept the default step and stop values. Copy range B7..B19 to cells C7, C20, and C33. Then enter the values shown in range D7..D45.

7. Formulas

Cell	Formula
F3	@COUNT(D7..D46) – 7
E13	@IF(B13<F2#OR#B13>F3,0, @AVG(D7..D19))
F13	@IF(E13=0,0,D13–E13)

Copy range E13..F13 to range E14..E39.

G7	+F7+F20+F33
H7	(F7<>0)+(F20<>0)+(F33<>0)
I7	+G7/H7

Copy range G7..I7 to range G8..G19.

I20	@SUM(I7..I19)
J7	+I7–(I$20/13)

Copy cell J7 to range J8..J19. Copy cell I20 to cell J20.

K7	+D7–@INDEX(J$7..J$19,0,C7–1)

Copy cell K7 to range K8..K45.

Save the worksheet.

LOTUS Models on CompuServe

The models we published in our 1989 and 1988 issues can now be downloaded from CompuServe. In case you missed our previous instructions, here's how to get the models you want.

You must have a modem and a communications program, of course. We also assume that you are a CompuServe subscriber and that you are a registered member of the Lotus Spreadsheets Forum (until recently known as the Lotus Integrated Forum). If either is not the case, please read the accompanying instructions on how to join.

If you're an experienced CompuServe user, you'll find much of the information here to be old stuff.

The easiest way to find a model is to know what issue it appeared in. Each month's *1-2-3* models are collected in a single file that is archived, or crunched, to minimize its size and your phone bill. Similarly, each month's *Symphony* models are collected in a single file.

So, to download a model, you have to download the file for that issue. Then you have to extract the individual files from the archive file. You need a special utility program called *Arce.exe* that you can also download from CompuServe. We'll tell you later how to get the utility. It is easy to use. To extract the models from an archive file named M18904.ARC, for example, the command is Arce a:M18904 (assuming the archive file is in your A drive).

When you do this, you will get several WK1 or WR1 files and a DOC file. The DOC file is an ASCII text file that you can read in DOS with a TYPE command. You can print it with a redirection command—for example:

```
type m18904.doc>prn
```

For each template, the file explains the purpose and lists the page number of the article in which the template appears. Where appropriate, it also notes readers' comments on the template that were received by the editors prior to the upload date.

TO GET A FILE

When CompuServe's main menu is on the screen, enter *go lotusa* at the prompt. The main menu for the Lotus Spreadsheets Forum, which is concerned with *1-2-3* and *Symphony*, appears. To access *LOTUS* magazine models:

1. Enter *3*—for LIBRARIES—at the prompt. The menu for the forum's libraries will appear.
2. Enter *10*—for *LOTUS* magazine—at the prompt. The menu for the forum's Library 10 will appear.

At this point, you can choose to view a directory of files, which contains no information about individual templates in a file, or to browse through an expanded directory that contains a short paragraph about the contents of each file.

To see the directory, enter 2. You will see a list of file names. Beside each file name is the upload date, the byte size, and a note indicating how many times that file has been accessed.

All *LOTUS* magazine file names start with M, for *magazine*. The second character is either 1, for *1-2-3*, or S, for *Symphony*. The third and fourth characters stand for the year—for example, 89. The fifth and sixth characters stand for the month—for example, 04 for April. So the name of the file containing *1-2-3* templates from the April 1989 issue is M18904.

If you find a file you want, make a note of the file name. Then, at the prompt, enter *download*, or *dow* for short. At the next prompt, enter the file name. CompuServe then asks you to choose a binary transfer protocol from a short menu. Your communications program probably supports the XMODEM protocol; if so, select menu option 1. Then CompuServe waits for you to set up your communications program to receive a file. Typically, you will have to issue a local "receive" command naming the transfer protocol (in *Crosstalk XVI*, for example, RX) and indicate the name you want to give the file and the disk that will receive it. When that is done, the file transfer begins.

The directory option is fine when you know the issue you want. If you don't know the issue, or if you want to know more about what templates are available, choose 1 for BROWSE on the Library 10 menu. You will be asked to specify a subject keyword. If you do not want to limit your browsing, enter *all*. You will then see the first page of a list that contains five- to six-line summaries of the group of *1-2-3* templates in each issue and similar summaries of the *Symphony* templates in each issue. You can page through the list. Each screen contains just one summary. If, while a summary is on the screen, you decide you want that file, enter *download*, or *dow*. You won't have to enter the file name; otherwise, proceed as above.

If you want to be more selective in your browsing, enter one or more keywords at the initial BROWSE prompt. All files carry keywords for the month and year of issue and for either *123* (the keyword list drops the hyphens) or *Symphony*. So if you enter *1989 123*, you will be shown only the summaries of 1989 files containing *1-2-3* templates. If you add the word *accounting*, what you see will be further restricted. If you do type more than one keyword, put a space between them.

To download the file extraction program, enter *lib11* at the prompt while viewing the main menu for the Lotus Spreadsheets Forum. Then, at the next prompt, enter *dow arce4c.exe* and then proceed as usual to set your communications program to receive a binary transfer. The file you receive expands itself into two files when you enter its name at the DOS prompt. One of the resulting files is the utility you want; the other is an ASCII text file that describes its use.

IF YOU'RE NOT A MEMBER

If you're not a CompuServe subscriber, it's easy to become one. Phone 800-848-8199 and ask for representative 146. If you're not in the United States or Canada, phone 614-457-0802 instead. You will get a sign-up package and a $15 credit against your connect-time charges. Connect time costs $12.50 per hour.

Even if you are a CompuServe subscriber, you cannot make full use of the Lotus Spreadsheets Forum without registering there: You'll be able to read messages but you won't be able to download files. Registering as a member of the Lotus Spreadsheets Forum won't cost you anything extra. At the main menu for the forum, you will see a final choice that invites you to join. Pick that choice, follow the instructions, and you're on your way. ○

THE 1989 LOTUS

INDEX

JANUARY THROUGH DECEMBER, 1989

INDEX LEGEND

The following letters appear throughout the index and denote the Lotus programs to which an entry pertains:

o = *1-2-3* **s** = *Symphony*

1-2-3
add-in software, compatibility with Rel. 2.2/3, Nov 10
A View of 1-2-3 tutorial, problem running on Zenith SupersPort 286, Aug 82
books (*see* **BOOKS**, 1-2-3)
CHK1-2-3 utility, checks whether machines have enough memory for Rel. 3, Nov 22
Chris Smith: "The Add-In Toolkit for *1-2-3* Release 3: Not Just for Developers," Dec 14
compatibility among releases, Oct 72
copy protection, removing with Lotus *1-2-3* Value Pack, Jul 76
graphs, how to build, Jan 42
installing with Intel Inboard 386, Mar 92
Japanese version, about, Oct 18
Japanese version, compatibility with American version, Mar 80
Lotus Add-In Toolkit for Release 3, about, Oct 17
Perfect Fit rebate offer for Rel. 2.2 or Rel. 3, Aug 20
Rel. 2, error in documentation, Jan 64
Rel. 2, password-protection feature, Oct 25
Rel. 2.01, ROM-card version for NEC UltraLite, Aug 20
Rel. 2.01, ZAP.COM file, about, Sep 97
Rel. 2.2, about, Apr 6, May 10
Rel. 2.2, ROM-card version for Poqet PC, Nov 22
Rel. 2.2, upgrade information, Sep 22
Rel. 2/2.01, Value Pack drivers allow display of 38 worksheet rows, Aug 80
Rel. 2.2/3, incorporate *Lotus HAL* features, Oct 17
Rel. 2.2/3, network versions, about, Jul 9, Oct 18
Rel. 2.2/3, new macro commands, Nov 28
Rel. 2.2/3, special report, Jul 83
Rel. 3, about, Apr 6, May 10, Aug 20
Rel. 3, upgrade information, Jul 9
System command, advanced uses, Feb 78, Jul 125
tips and tricks, May 48, Sep 6
use of at Bankers Trust Co., Jun 52
use of at Conoco, May 44

ACCOUNTING
accounts payable model, o: Jul 50, Oct 4; @ERR, Oct 4
amortization schedule, creating, o,s: Nov 56
budgets, combining general-ledger accounts into broader categories, o,s: Jun 70
capital leases vs. operating leases, o,s: Aug 62
check-register model, o: Jun 36; s: Oct 44
depreciation schedules, o,s: May 82
interest costs, forecasting, o,s: Feb 46; @ERR, Jun 7
overhead allocations, calculating, o,s: May 55
software (*under* **SOFTWARE**, *see* accounting, budgeting)
volume discounts, calculating, o,s: May 60
see also **FINANCE, INVENTORY, PAYROLL**

APPLE COMPUTER
developing new font standard with Microsoft, Dec 11

APPLICATION DEVELOPMENT
computer-aided software engineering (CASE), about, Aug 11
DCA/Intel Communicating Applications Specification, Jan 12
designing easy-to-use applications, o,s: Feb 59
designing large-scale worksheets, Jun 30
designing multiple-worksheet applications, o,s: Jun 45
executive information system development software, Apr 53
hypertext applications, Mar 12
Lotus Add-In Toolkit for Release 3, about, o: Oct 17
Lotus and Digital Equipment Corp. development agreement, Jan 17
Lotus DataLens Developer Toolkit, about, o: Oct 17, Nov 22
Microsoft OS/2 Software Development Kit, installing on PS/2 Model 80, Mar 92
"Philippe Kahn Describes the Delicate Art of Software Programming," Jun 14
prompting for user input, o: Aug 28, Oct 28
see also **MACROS, GENERAL**

ARTIFICIAL INTELLIGENCE
expert systems, about, Feb 11
hypertext programming technique, Mar 12

ASCII
collating sequence, effect, o: Feb 78
fixed-length database file, importing into *1-2-3*, Feb 70
transferring between DEC Rainbow and IBM PC, o: Mar 92

BANKERS TRUST CO.
use of *1-2-3*, Jun 52

BOARDS
8514/A, about, Jul 15
Artist 12 MC high-resolution graphic controller, Jun 118
BocaRAM/AT Plus, Mar 110
The Complete PC Complete Fax/9600, Aug 85
EGA, about, Jul 15
Hercules VGA Card, Jul 144
Intel Connection CoProcessor, Jan 14, May 105, Aug 85
Intel DVI, Feb 22
Intel Inboard 386, installing *1-2-3*, Mar 92
LaserMaster LX6 Professional Controller, Sep 118
Mac/DOS II coprocessor, May 110
Q-Script, PostScript printer-controller, May 110
Quadram JT Fax 9600, Aug,85
scanner interfaces, OmniPage MS-DOS Version 1.0, Jan 100
scanner interfaces, TrueScan, Jan 100
speech-digitizing, Jul 22
STD-386CP, replacement motherboard for 8086-based Compaq Deskpro, Jun 118
Tallgrass ShortCut accelerator, Sep 118
VGA, about, Jul 15
see also **FAX**

BOOKS
1-2-3:
  1-2-3 Database Techniques, D. Andersen and B. Weil, Nov 118
  1-2-3: From 2 to 3, The LeBlond Group, Oct 103
  1-2-3 Graphics Techniques, S. Sagman, Nov 118
  1-2-3 Macro Library, 3rd ed., Que Corp., Dec 108
  1-2-3 QuickStart, Que Corp., Feb 103
  1-2-3 Release 2.2 Business Applications, Que Corp., Nov 118

TEAR HERE

1-2-3 Release 2.2: The Complete Reference, M. Campbell, Oct 103
1-2-3 Release 2.2 Made Easy, M. Campbell, Oct 103
1-2-3 Release 2.2 Quick Reference, Que Corp., Nov 118
1-2-3 Release 2.2 QuickStart, Que Corp., Nov 118
1-2-3 Release 3 Business Applications, E. M. Donie, Jul 146
1-2-3 Release 3: The Complete Reference, M. Campbell, Dec 108
1-2-3 Release 3 Made Easy, M. Campbell, Dec 108
1-2-3 Release 3 Quick Reference, Que Corp., Dec 108
1-2-3 Release 3 QuickStart, Que Corp., Jul 146
1-2-3 Release 3 Workbook and Disk, L. Metzelaar and M. Fox, Sep 119
1-2-3 Spreadsheet Design, J. M. Nevison, Nov 118
1-2-3 Tips, Tricks, and Traps, 3rd ed., D. Andersen, Oct 103
The 1-2-3 Upgrade Guide, E. M. Lunsford, Nov 118
The ABC's of 1-2-3 Release 2.2, C. Gilbert and L. Williams, Dec 108
The ABC's of 1-2-3 Release 3, J. Robbins, Dec 108
Advanced Techniques in Lotus 1-2-3, E. M. Lunsford and P. Antoniak, Feb 103
The Complete Lotus 1-2-3 Release 2.2 Handbook, G. Harvey, Dec 108
Douglas Cobb's 1-2-3 Handbook, Release 2.2 Edition, D. Cobb, Nov 118
Encyclopedia of Lotus 1-2-3: Release 3: The Master Reference, R. Stark, Nov 118
The Good Ideas Book, *LOTUS* magazine staff, Apr 97
Instant Access Guide to Lotus 1-2-3, N. Mann, Feb 103
Lotus 1-2-3 for Beginners, P. Bosetti, Aug 98
Lotus 1-2-3 Release 3.0: The Bridge Book, S. Moores, Nov 118
Lotus 1-2-3 Simplified, Release 3, D. Bolocan, Nov 118
Lotus 1-2-3 Tips and Tricks, G. Weisskopf, Feb 103
The Lotus Guide to 1-2-3 @Functions, M. Campbell, Sep 119
The Lotus Guide to 1-2-3 Release 3, D. Bookbinder, Aug 98
The Lotus Guide to Agenda, R. H. Flast and L. M. Flast, Jan 102
The Lotus Guide to Freelance Plus Release 3, D. Wainwright, Sep 119
The Lotus Guide to Learning 1-2-3, Lotus Development Corp., Sep 119
The Lotus Guide to Learning 1-2-3 Release 2.2, Lotus Development Corp., Nov 118
Mastering 1-2-3 Release 3, C. Jorgensen, Dec 108
The Stephen Cobb User's Handbook to Lotus 1-2-3, Release 3, S. Cobb, Nov 118
Total 1-2-3/Release 3, P. Randall and S. Bennett, Nov 118
Upgrading to 1-2-3 Release 3, Que Corp., Jul 146
Using 1-2-3 Release 2.2, The LeBlond Group, Oct 103
Using 1-2-3 Release 2.2, Special Edition, Que Corp., Nov 118
Using 1-2-3 Release 3, M. Matthews and C. Boggs Matthews, Oct 103
Using 1-2-3 Release 3, Que Corp., Jul 146
DOS:
  DOS Tips, Tricks, and Traps, C. DeVoney, Jun 118
  Supercharging MS-DOS, 2nd ed., V. Wolverton, Aug 98
Lotus Agenda:
  Lotus Agenda, I. Sinclair, Jan 102
  Lotus Agenda Applications, J. Guenther and A. Wayman, Jun 118
  Using Agenda, M. Campbell, Jan 102
  Using Lotus Agenda, H. Goodman and D. J. Wolf, Aug 98
  Working With Lotus Agenda, J. R. Ottensmann and J. Neuenschwander, Jun 118
Lotus Manuscript:
  The Lotus Guide to Using Manuscript Release 2, C. Williams, May 110
Symphony:
  Mastering Symphony, 3rd ed., D. Bolocan, Jul 146
Other:
  Alfred Glossbrenner's Master Guide to Free Software for IBMs and Compatible Computers, A. Glossbrenner, Mar 110
  The Book of Fax: An Impartial Guide to Buying and Using Facsimile Machines, D. Fishman and E. King, Feb 103
  The Computer Industry Almanac 1989, E. Juliussen and K. Juliussen, Apr 97
  Groupware: Computer Support for Business Teams, R. Johansen, Apr 97
  The HyperPAD Companion, M. W. Crane and J. R. Pierce, Jul 146
  LaserJet Companion, M. W. Crane and J. R. Pierce, May 110
  LaserJet Unlimited, Edition II, T. Nace and M. Gardner, Mar 110
  Lotus Companion: Added Software Resources, R. Richardson, May 110
  The Makeover Book: 101 Design Solutions for Desktop Publishing, R. C. Parker, Oct 103
  PC Care Manual: Diagnosing and Maintaining Your MS-DOS, CP/M, or Macintosh System, C. Morrison and T. S. Stover, Mar 110
  The Scanner Book, S. Beale and J. Cavuoto, Aug 98
  Upgrading and Repairing PCs, S. Mueller, Jun 118
  Using dBase IV, E. Jones, Jun 118
  Using Microsoft Word 5, G. M. Perry, Sep 119
  Webster's New World Dictionary of Computer Terms, Apr 97
  The Winn Rosch Hardware Bible, W. L. Rosch, Nov 118
  WordPerfect 5: Desktop Publishing in Style, D. Will-Harris, Feb 103
  Write Better with a PC, M Murach, Jul 146

BUDGETS
software (*see* SOFTWARE, budgeting)
see also ACCOUNTING, FORECASTING

CARDS. *See* BOARDS

CD-ROM
CD/Investment: U.S. Equities financial database, Dec 22
CD/M&A, merger-and-acquisition database, Oct 17
CD/Networker, about, Jan 17
Compustat PC Plus Corporate Text, Sep 117
Computer Library, Jan 100
databases, cost of, May 24
digital video interactive technology, Aug 16
Lotus Prompt CD, Jan 17
new applications, Aug 17

CELL FORMAT
currency, changing with LICS, o,s: Jan 65
fixed, rounding with 0 decimal places, o,s: Mar 84
fundamentals, o: Jul 24
global default settings, using, o: Apr 70
global settings, using, o: Aug 22
numeric, retaining during file translation, o: Sep 100

CELL POINTER
commands within macros, o,s: Feb 80
keeping at destination range after copying (macro), o,s: Aug 73
movement in macros, controlling with formulas, o,s: Mar 91
moving about the worksheet in Point mode, o,s: Dec 88
moving about the worksheet (macro), o,s: Apr 35
scrolling, minimizing, o,s: May 88

CELL REFERENCE
absolute, copying as relative, o,s: Sep 102, Oct 77
beginner's guide, o,s: Aug 44
to enter graph titles/legends, o,s: Mar 91

CELLS
annotating (macro), o: Mar 34 (@ERRS, May 7, Jun 7); s: Nov 41
centering a heading over a range, o,s: Jan 68
erasing a single, o: Nov 4
locating those that depend on a specific cell, o,s: Dec 88
moving from formula cell to referenced cell (macro), o,s: Jul 127
underlining characters within, o,s: Mar 84, Nov 94, Dec 84
updating with @NOW/@TODAY, o,s: Dec 91
updating with relative formulas, o,s: Mar 91, Sep 100

CHARITY
corporate philanthropy in the computer industry, Nov 14

COLUMN WIDTHS. *See* WORKSHEETS

COMMUNICATIONS
CompuServe CCF file causes display problem, s: Feb 82
DCA/Intel Communicating Applications Specification, Jan 12
Intel Connection CoProcessor, Jan 14, May 105, Aug 85

interactive television, Jul 22
on-line English-Japanese translation services, Nov 20
software (*see* SOFTWARE, communications)
see also ELECTRONIC MAIL, FAX, INFORMATION SERVICES, MODEMS, VOICE

COMPATIBILITY
1-2-3, between American and Japanese versions, Mar 80
1-2-3 add-in software, with Rel. 2.2/3, Nov 10
among *1-2-3* and *Symphony* releases, Oct 72
DEC Rainbow and IBM PC, o: Mar 92
running DOS programs under OS/2, Mar 11

COMPUTERS
80286 vs. 80386, Oct 6
80386, more powerful but lacks software, Mar 8
80386SX, less expensive, Mar 10
access for the blind, Mar 17
in business-school curriculum, Sep 60
cellular, May 25
Compaq 286/386, problems printing from parallel ports, May 90
Compaq Deskpro, STD-386CP replacement motherboard, Jun 118
computer-assisted adult-literacy program, Dec 17
DEC Rainbow and IBM PC, file compatibility, o: Mar 92
"deskless," Innovation Model 2001 ST, Mar 18
IBM PS/2 Model 80, problem installing Microsoft OS/2 Software Development Kit, Mar 92
Macintosh, Mac/DOS II coprocessor, May 110
NEC Powermate, problem altering display colors, o,s: Oct 81
PCs, manufacturer efforts to improve speed, May 16
used, Aug 14; @ERR, Oct 4
Wang Freestyle system, Feb 22
workstations, DEC's entry into the market, Apr 14
Your PC..Inside Out videotape, Jan 102
see also PORTABLE COMPUTERS

CONOCO
use of *1-2-3*, May 44

COPYING
absolute formulas as relative, o,s: Sep 102, Oct 77
cells (macros), o: Sep 38
cells with Copy command, o: May 26
formulas with @REPEAT, o,s: Jan 70
long formulas down a column, bug, o,s: Feb 80
macros, o: Apr 31
making multiple copies of a range without respecifying source, o,s: Oct 82
minimizing cell-pointer scrolling, o,s: May 88
values down a column, o,s: Mar 82, Jul 115

COPY PROTECTION
removing with Lotus *1-2-3* Value Pack, Jul 76, Nov 4

CRITERION. *See* DATABASES, FORMULAS, RANGE NAMES, RANGES

CURSOR. *See* CELL POINTER

DATABASES
adding space between field name and records, o: Jan 71
breaking a field name into two lines, o: Dec 91
check-register, s: Oct 44
controlling sort order, o,s: Dec 85
creating specialized reports, s: Jan 65
criterion, using range name in, o,s: Feb 72
criterion, using wild card, o,s: Mar 82
criterion, verifying before extracting or deleting records, o: Apr 77
Criterion range, specifying multiple, o,s: Jun 98
data queries, generating (macros), o: Dec 28
Data Query Extract, range mix-up, o: Jan 64
Data Query Extract, separating sections of a database, o: Feb 70, Jul 115
data query operations, fundamentals, o: Dec 24
disk-based, creating (macro), o: Apr 27
distinguishing uppercase/lowercase letters, o: Feb 76
editing records found by Query Find, o,s: May 90
entry form, maximum size, s: Feb 82
extracting all but specific records, o,s: Feb 76
extracting information, fundamentals, o: Nov 24
extracting only records with labels in a particular field, o,s: Aug 79
extracting records with blank fields, s: Nov 94
finding duplicate field entries, o,s: Aug 78
finding labels within, o,s: Nov 98
fixed-length ASCII, importing into *1-2-3*, Feb 70
form letters from, creating, o: Aug 38
FORM window, inserting hyphens in phone numbers, s: Mar 80
fundamentals, o: Sep 25, Oct 20
generating reports, s: Dec 77
keeping parsed data aligned after importing files, o: Sep 96
managing, special report, o,s: Dec 63
printing record number without entering it in a separate field, s: Apr 76
software (*see* SOFTWARE, database)
sorting by year, then month, o,s: Dec 85
sorting entries alphabetically by last name, o,s: May 89
sorting on more than two keys, o: Mar 90, Sep 100
statistical @functions, adjusting column-offset number automatically when copying, o,s: Jun 105
statistical @functions, preventing from calculating labels as zero, o,s: Jul 112
statistical @functions, summing columns, o,s: Jun 94
summing selected records, o,s: May 84; o: May 89
suppressing zeros in empty fields, o,s: Feb 77
see also CD-ROM, INFORMATION SERVICES, STRUCTURED QUERY LANGUAGE

DATA ENTRY
Data Fill, to enter list numbers into a column, o,s: Sep 94
Data Fill, to invert entries in a column, o,s: Jan 66
entering data beyond worksheet boundaries, o: Sep 96
using labels to represent values in formulas, o,s: Dec 87

DATA SECURITY
computer crime, Jun 18
files, recovering, o,s: Oct 52
hard disks, new backup technologies, Jan 14, May 6
keyboard password, changing on PS/2 Model 80, Mar 92
software (*see* SOFTWARE, data security)
viruses, macro-based, Sep 9
see also WORKSHEET PROTECTION

DATA STORAGE
digital archives, retrieval problems, Jan 11
see also DISKS

DATA TABLES
calculating number/amount of payments to reach goal, o,s: May 61
one-way what-if, generating (macro), s: Feb 32
summing specific items in a column, o,s: Apr 71
two-way what-if, generating (macro), s: Mar 28

DATE/TIME
converting Julian dates to Lotus date serial numbers, o,s: Oct 83
@DATE, to calculate customer payment dates, o,s: May 60
@DATE, to enter dates, o,s: Jan 68, Jun 106
date numbers, splitting into year, month, and day components, o,s: Jul 126
dates, filling a range with consecutive, o,s: Jan 70
date-stamping worksheets (macro), o,s: Jun 106
@DATEVALUE vs. @DATE, o,s: Sep 102
determining day of week, o,s: May 88, Aug 74; s: Nov 44
determining first or last day of successive months, o,s: May 88
determining number of weekdays spent on a project, o,s: Aug 74
determining previous Sunday's date, o,s: Sep 101
determining what day a serial date falls on, o,s: May 60
fiscal-month calculations, producing with statistical @functions, o,s: Oct 82

@INT, to truncate decimal values in @NOW, o,s: Nov 98
life span, calculating in years, months, and days (macro), s: Feb 35
printing current month/year in report headings, o,s: Sep 100
sorting a database by year, then month, o,s: Dec 85
using date values on graph's X axis, o: Sep 96

DECIMALS
converting integers to, s: Jan 24
converting values from base 8 to base 10 (macro), o: May 32
displaying without leading zero, o: May 88
inserting (macro), o: May 32
see also ROUNDING

DESKTOP PUBLISHING
Display PostScript, page-description language for screens, Mar 10
software (*see* SOFTWARE, desktop publishing)

DIRECTORIES
changing levels, o,s: May 90

DISKS
copy protection, removing with Lotus *1-2-3* Value Pack, Jul 76
Disk full error message, o: Jan 66, Apr 73
fundamentals, o: Jun 24, Nov 6
hard, greater capacity and lower prices, Apr 13
hard, new backup technologies, Jan 14, May 6
removable hard-disk systems, May 102
see also CD-ROM

DISPLAY
changing colors, o,s: May 84, Oct 81
creating decorative worksheet borders, o: Oct 83
Display PostScript, page-description language for screens, Mar 10
protecting from "burning" by using DOS batch file, Apr 75
protecting with GRAPH key, o: Feb 78
recording and reproducing (macro), o: Feb 26; @ERR, Jun 7
software (*see* SOFTWARE, display)
see also MONITORS

DOC WINDOW
specifying as the default window type, s: Mar 80

DOS
backup copies of files, creating multiple, Apr 76
batch file protects screen from "burning," Apr 75
batch files, passing control from *1-2-3* to an external program, o: Jan 20
books (*see* BOOKS, DOS)
CHKDSK command, about, Jan 66
CHKDSK/FIND commands, to locate files, Jul 125
EDLIN, eliminating BAK files automatically, Jul 125
extenders, software-development tools, Jun 10
FORMAT command, avoiding disaster, o,s: May 91
fundamentals, o: Jun 24
PATH statement, using in batch files to avoid having to change directions, o: Dec 91
PRINT command, to print ASCII or PRN files quickly, Mar 92

DRIVERS
1-2-3 cannot start because the driver set is invalid error message, o: Jul 114
in *1-2-3* Value Pack, allow display of 38 worksheet rows, Aug 80
adding by using Install program causes *Error reading a driver file* error message, o,s: Oct 82, Dec 88
DataLens and Lotus DataLens Developer Toolkit, about, o: Oct 17, Nov 22
expanded-memory, to run DOS programs under OS/2, Mar 11
fax board, for *WordPerfect* 5.0, Apr 96
graphics card, installing, o: Mar 80
Hercules 90-by-38, to generate larger database form, s: Feb 82
printer/plotter, table, o,s: Mar 66

EDUCATION
business schools, integration of computers into curriculum, Sep 60
computer-assisted adult-literacy program, Dec 17
educational discounts on Lotus software, Sep 22
savings plan for college tuition, o,s: Aug 32
software (*see* SOFTWARE, education)
see also TRAINING

ELECTRONIC MAIL
MCI Mail, lesser-known features, Nov 101

ERROR MESSAGES
1-2-3 cannot start because the driver set is invalid, o: Jul 114
Cannot alter this area of document, s: Aug 80
Cannot move or copy data beyond worksheet boundaries, o: Sep 96
Disk full, o: Jan 66, Apr 73
Error reading a driver file, o,s: Oct 82, Dec 88
The input file is not a valid DIF file, o,s: Jun 96, Jul 113
Installation error code=8362, o: Mar 92
Macro: Invalid expression in IF (B75), o: Sep 96
Memory full, s: Oct 80
More than 16 X variables, o,s: Dec 90
Not a valid worksheet file, o,s: Jun 96
Part of file is missing, May 85; o,s: Oct 77
There is data missing from one or more fields in the database, o,s: Nov 98
Worksheet file revision is out-of-date, o: Apr 70
Worksheet full, o,s: Aug 74

ERRORS
in *1-2-3* Rel. 2 manual, Jan 64
dividing zero by zero returns ERR, o,s: Mar 86
ERR, suppressing in formulas, o,s: Nov 99
Parity Check, May 84
string result of formula causes @SUM to return ERR, o,s: Apr 73
worksheet, correcting, o: Apr 24
worksheet, ways to avoid, o,s: Feb 50

ESSAYS
"Apple Focuses on the Dull but Important," Apr 98
"The Changing User-MIS Relationship," Dec 110
"The Easy Way Is the Best Way," Oct 104
"Inside-Out Logic Is Very Confusing," Jan 104
"The Lotus Cross-Platform Strategy," Sep 120
"Lotus's Next Challenge," May 112
"Software for the 1990s," Nov 120
"Software's Uncharted Territory," Jun 120
"So This Is Comdex," Feb 104
"Still Waiting for the Right Products," Aug 100
"Why I Keep Buying Computer Books," Mar 112
"Why the Lotus Aftermarket Is in Trouble," Jul 148

FAX
from aircraft, Sep 20
Communicating Applications Specification simplifies fax-board software, Oct 16
The Complete PC Complete Fax/9600, Aug 85
fax-board driver for *WordPerfect* 5.0, Apr 96
fax pack for *Lotus Express*, about, Dec 22
PC fax boards vs. stand-alone units, Jun 14
Quadram JT Fax 9600, Aug 85
Ricoh Portable Digital Information System fax, copier, and scanner combination, Sep 117
sending via electronic-mail services, Aug 86, Dec 4
Switch Model A-1, eliminates separate dedicated fax/phone lines, Sep 118
WorldPort 2496 fax and modem combination, Mar 108

FILES
backup copies, creating multiple, Apr 76
Cannot alter this area of document error message in DOC window after File Combine, s: Aug 80
combining, o,s: Apr 44
combining faster with File Xtract, o,s: Jul 126
determining existence of with {OPEN} command, o: Jun 26
extracted, creating more compact, o,s: Aug 74
extracted, deleting range names, o: Dec 87
File Combine to convert formula results to values, o,s: Jun 97
File commands, about, o: Feb 54
file-management macro keywords, o: Apr 30
file names, importing, o,s: Sep 70
File Retrieve, aborting, o,s: Aug 73
The input file is not a valid DIF file error message, o,s: Jun 96
locating, tips, o,s: Jun 88
locating, with DOS CHKDSK and FIND commands, Jul 125
losing, causes of, Jan 66, May 85; o,s: Oct 77
Lotus file formats, technical information, o,s: Oct 80

Not a valid worksheet file error message, o,s: Jun 96
Part of file is missing error message, o,s: May 85, Oct 77
preventing the display of file names when combining, o,s: Aug 75
protecting (*see* WORKSHEET PROTECTION)
recovering, o,s: Oct 52
retrieval problems, o,s: Jun 96
retrieving (macro), o,s: Aug 78
saving when low on RAM, o,s: Jun 98
software (*under* SOFTWARE, *see* file management, file recovery)
translating (*see* FILE TRANSLATION)
using both in office and at home, o: Aug 76
Worksheet file revision is out-of-date error message, o: Apr 70
see also DIRECTORIES

FILE TRANSLATION/FILE TRANSFER
1-2-3/Symphony to *dBase III*, Oct 84
1-2-3 to comma-delimited ASCII, o,s: Apr 72
1-2-3 to *DisplayWrite 4*, o,s: Aug 73
ASCII, between DEC Rainbow and IBM PC, o: Mar 92
ASCII, fixed-length to *1-2-3*, Feb 70
dBase III Plus to *1-2-3/Symphony* and back, Nov 98
dBase III to *1-2-3/Symphony*, for faster math functions, Feb 80
dBase III to *1-2-3/Symphony*, Jul 112
DIF to *1-2-3* Rel. 2.01, problem, o,s: Jun 96, Jul 113
end-of-line characters, manipulating for consistent record length, o,s: Aug 75
Japanese version of *1-2-3* to American version, Mar 80
Lap-Link Mac Version 2.0, Feb 102
between Macintosh and IBM PC, Mar 15
retaining numeric formats in translations, o: Sep 100
software (*see* SOFTWARE, file translation)

FINANCE
calculating cost of loan repayment, o,s: May 58
calculating number/amount of payments to reach goal, o,s: May 61
calculating remaining loan principal, o,s: May 58
calculations for loans/annuities, o,s: May 65
credit card cost-comparison model, o,s: Jul 40
retirement-planning model, o,s: Apr 66
savings plan for college tuition, o,s: Aug 32
software (*see* SOFTWARE, finance)
see also ACCOUNTING, FORECASTING, INSURANCE, INVESTMENT, REAL ESTATE

FORECASTING
business cycles, anticipating and analyzing, o,s: Oct 40
interest costs, o,s: Feb 46, Jun 7
long-range using logistic-curve method, o,s: Jun 58
long-range using modified-exponential method, o,s: Jul 70
monitoring, quality-control model, o,s: Apr 54
software (*see* SOFTWARE, forecasting)
United States population, o,s: Sep 50
see also STATISTICS

FORMS
form letters, creating, o: Aug 38
software (*see* SOFTWARE, forms processing)

FORMULAS
in *1-2-3* Rel. 1A won't return labels, Nov 91
absolute, copying as relative, o,s: Sep 102, Oct 77
adjusting column-offset number automatically when copying database statistical functions, o,s: Jun 105
beginner's guide, o,s: Apr 59
in cells, locating with Range Unprotect, o,s: Jul 127
concatenating label and references to, o,s: Oct 85
converting column-offset number to column letter, o,s: Jan 68
converting dollar amount to percentage, o,s: Feb 82
converting results to values, o,s: Jun 97, Dec 84
copying down a column, bug, o,s: Feb 80
copying with @REPEAT, o,s: Jan 70
criterion, using asterisk in, o,s: Feb 76
criterion, using range names in, o,s: Feb 72
cross-checking, using @ROUND to correct errors, o,s: Apr 74
cubing values, o,s: Feb 72
erased, recapturing, o: Sep 100
filling a range with consecutive dates, o,s: Jan 70
forcing to return .00% instead of ERR, o,s: Jan 66
lookup based on two independent variables, o,s: Feb 80
relative, to update cells, o,s: Mar 91, Sep 100
self-updating, to use last value in column, o,s: Nov 91
sorting in a column, o: Sep 95
special report, o,s: Sep 73
suppressing all zeros in a column but the total, o: Jul 114
vs. macros, o,s: Sep 81
writing with @MAX, o,s: Aug 78
see also @FUNCTIONS

FORM WINDOW. *See* DATABASES

FUNCTION KEYS
CALC, viewing subtotals, o,s: Jan 70
COMPOSE key, about, o,s: Oct 80
COMPOSE key, to make phi character, o,s: Oct 76
GOTO and NAME keys, to produce full-screen list of range names, o,s: Oct 80
GOTO key, to move about worksheet in Point mode, o,s: Dec 88
GRAPH, to protect display, o: Feb 78
incorporating into macros, o: Feb 36
see also KEYBOARD

@FUNCTIONS
@@, embedding in @VLOOKUP for variable input, o,s: Sep 102
@@, for multiple-table lookups with @VLOOKUP, o,s: Nov 88
@@, to change sum ranges, o,s: Oct 80
@@, to maintain proper reference when range name is changed or deleted, o,s: Nov 97
beginner's guide, o,s: Sep 76
@CELLPOINTER, role in macros, s: May 36
@COUNT, to determine word count, o: May 30
date functions (*see* DATE/TIME)
@DAVG, preventing from calculating labels as zero, o,s: Jul 112
@DSUM, to sum a column based on a criterion, o,s: Apr 71
@DSUM, to sum every *n*th cell in a column, o,s: Jan 71
@DSUM, to sum selected entries in a column, o,s: Apr 71, May 84; o: May 89
@EXACT, to distinguish uppercase from lowercase, o,s: Mar 86
fundamentals, o: Jul 24; o,s: Nov 73
@IF, to calculate percentage change in year-to-date sales, o,s: Jun 98
@IF, to calculate salary increase, o,s: Jul 112
@IF, to calculate volume discounts, o,s: May 60
@INDEX, for two-way lookup, o,s: Feb 80
@INDEX, to create data-conversion macro, s: Jan 24
@IRR, problem assuming reinvestment rate, o,s: Jul 58
@IRR, problem calculating rate of return, o,s: Jan 66
@IRR, to calculate investment profitability, o,s: May 80
@ISAPP, won't work without Add-In Manager, o: Sep 96
@ISERR, to suppress ERR in formulas, o,s: Nov 99
@ISNUMBER, forcing to ignore blank cells, o,s: Sep 95
@ISSTRING, to extract database records with labels in a particular field, o,s: Aug 79
@MAX vs. @IF in formulas, o,s: Aug 78
@MOD, to determine what day a serial date falls on, o,s: May 60
@MOD, to round to nearest five dollars, o,s: May 82
@NOW, to date-stamp worksheets, o,s: Jun 106
@NOW/@TODAY, to update cells, o,s: Dec 91
@PMT, to calculate cost of loan repayment, o,s: May 58
@PV, to calculate remaining loan principal, o,s: May 58
@RAND, creating spreadsheet-based simulation, o,s: Jan 59
range argument with, o,s: Feb 77
@REPLACE, to concatenate labels with formula references, o,s: Oct 85
@ROUND (*see* ROUNDING)

software (*see* SOFTWARE, @functions)
solving business problems, quiz, o,s: May 58
string, to manipulate labels, o,s: Jun 63
@SUM, string result of formula causes ERR, o,s: Apr 73
@SUM, summing a block of data, o,s: Feb 72
@SUM, to determine percent increase in salaries, o,s: May 59
@SUM, with variable start/end cells (macro), o,s: Feb 76
@TERM, limitation, o: Apr 72
@TERM, to calculate number/amount of payments to reach goal, o,s: May 61
tips and tricks, o,s: Jan 54
tutorial, *Indexer for 1-2-3*, Jan 102
@VALUE, to add across rows, o,s: Mar 86
@VLOOKUP, to find rows with matching entries in two columns, o,s: Dec 86
@VLOOKUP, to find the factorial of a positive integer, o,s: Jun 105
@VLOOKUP, to generate part-number description automatically, o,s: May 83
@VLOOKUP, to incorporate weekly data into monthly report, o,s: Feb 72
@VLOOKUP/@HLOOKUP, to find a table entry, o,s: Nov 90
see also FORMULAS

GRAPHICS
boards (*see* BOARDS)
cards (*see* BOARDS)
clip art, computerized, Jul 14
scalable technology vs. bit-mapped, Nov 20
software (*see* SOFTWARE, graphics)
standards, about, Jul 15
Viewframe II + 2 overhead-projection panel, Mar 110

GRAPHS
bar, changing colors and hatch patterns, o,s: Dec 88
bar, controlling bar width, o,s: Jun 97
data labels, alternative ways to create, o,s: Dec 90
displaying (macro), o: Mar 90, May 33
how to build, overview, o: Jan 42
legends, entering with cell references, o,s: Mar 91
line, correcting overcrowded X-axis labels, o,s: Apr 74
printing high-density on DEC LA50, Apr 73
problem with line spacing between X-axis title and legends, o,s: Aug 74
saving (macro), o: May 34
suppressing display of when updating, o,s: Aug 75
titles, entering with cell references, o,s: Mar 91
using date values for the X axis, o: Sep 96
using string functions to create, o,s: Jan 33
viewing, problem, o: Mar 80
XY, graphing different X-range values, o,s: Jun 102

HEADERS/FOOTERS
aligning, o: Aug 80
editing header (macro), o,s: Jun 102
including spreadsheet data in header, o,s: May 82
page numbers cut off in header, o: Feb 76

HEALTH
Eye Relief, large-type word processor, Aug 18

HYPERSPACE. *See* MACRO LIBRARY MANAGER

INFORMATION SERVICES
CompuServe, CCF file causes display problem, s: Feb 82
CompuServe, leaving messages for *LOTUS* magazine staff, Dec 22
CompuServe, models from *LOTUS* magazine, Nov 87
Computer Database Plus, computer periodicals database, Jun 113
MusicWriter sheet music network, Sep 20
on-line business databases, improvements in, May 18
on-line vs. CD-ROM, May 24

INITIALIZATION STRINGS. *See* SETUP STRINGS

INPUT DEVICES
The Kurzweil Discover Freedom, Nov 117
LCD tablet, Jan 18
MarqPlus, mouse-keyboard interface, Dec 106
mice, Lotus-certified compatible, o,s: Apr 73
mouse, PowerMouse 100, Aug 97
mouse, problem using with modem, s: Nov 99
ScanMan, hand-held scanner, Feb 102
scanner interfaces, OmniPage MS-DOS Version 1.0, Jan 100
scanner interfaces, TrueScan, Jan 100
scanners, future trends, Dec 17
scanners, Ricoh Portable Digital Information System scanner, copier, and fax combination, Sep 117

INSURANCE
life insurance analyzer model, o,s: Sep 57
worker's compensation, insurance-premium analysis, o,s: Oct 67

INTERVIEWS
Larry Bertram: "What *1-2-3* Users Should Know About Unix," Oct 12
Betty Brooks: "User Groups Grow Up," Jan 14
"Matthew Carter, a Champion of Good Typography," Sep 14
Sonny Chaffin: "Will There Be a 650-Megabyte Optical Drive in Your PC Soon?," Aug 12
"Philippe Kahn Describes the Delicate Art of Software Programming," Jun 14
"Said Mohammadioun Stakes Company on New Program," Mar 14
"Therese Myers, a Champion of Multitasking," May 18
"William Rash on Intel's Next-Generation CPU—The i486," Jul 18
Chris Smith: "The Add-In Toolkit for *1-2-3* Release 3: Not Just for Developers," Dec 14
"Bruce Thatcher Predicts a Boom in Color Printing," Nov 14
Steve Wolfram: "Making Advanced Mathematics Understandable," Feb 18

INVENTORY
determining economic order quantity, o,s: Apr 62, Aug 4
valuing with the LIFO method, o,s: Feb 42

INVESTMENT
24-hour electronic, Sep 20
CD/Investment: U.S. Equities financial database, Dec 22
Compustat PC Plus Corporate Text Package, Sep 117
computerized, Feb 13, Jul 4
earnings per share, calculating, o,s: Jan 38
electronic auditing of traders, Nov 20
float funds, managing, o,s: Nov 76
initial public offerings, analyzing, o,s: Aug 56
@IRR, problem assuming reinvestment rate, o,s: Jul 58
lump-sum, analyzing, o,s: Mar 46, Jun 7
market value, calculating when bid price includes decimal, o,s: Apr 74
mutual-fund assessment model, o,s: Jul 64, Nov 4
optimum timing, predicting, o,s: Oct 32
software (*see* SOFTWARE, investment)
treasury-bond-yield analysis, o,s: Feb 65, Jun 7, Jul 4

KEYBOARD
arrow keys, to set column widths, o,s: Jan 70
lockup, recovering from, Mar 86
lockup, when using *1-2-3* with *Allways*, Nov 99
numeric input using Shift key, o,s: Jun 104
PS/2 Model 80, changing password, Mar 92
see also FUNCTION KEYS

LABELS
concatenating (macro), s: Jan 27
concatenating with formula references, o,s: Oct 85
converting to values (macro), s: Jan 26
extracting specific characters, o,s: Nov 91
finding within a database, o,s: Nov 98
formulas in *1-2-3* Rel. 1A won't return, Nov 91
right-aligning within a worksheet, o,s: Oct 77
using string formulas to manipulate, o,s: Jun 63
using to document worksheet, o: Apr 21
see also MAILING LABELS

LANS. *See* NETWORKS

LOOKUP TABLES
to enter labels representing values used in formulas, o,s: Dec 87

LOTUS AGENDA
books (*see* BOOKS, Lotus Agenda)
The Builder's Organizer, software for *Lotus Agenda*, Sep 117
Critical Path Project Management, software for *Lotus Agenda*, Jun 116
Info Center Hotline, software for *Lotus Agenda*, Sep 117

for OS/2, about, Jan 17, Mar 110
preconfigured databases for, Jun 116
Rel. 1.0, ROM-card version for NEC UltraLite, Aug 20
Rel. 1.01, about, Jun 20
ROM-card version for Poqet PC, Nov 22
training videotapes, Jan 102

LOTUS DEVELOPMENT CORP.
battles Microsoft for spreadsheet market share, May 12
development/marketing agreement with Sun Microsystems, Sep 23
development/marketing/distribution agreement with Sybase, Nov 22
"Lotus's Next Challenge," essay, May 112
SQL-database strategy, Oct 60
"Still Waiting for the Right Products," essay, Aug 100
"Why the Lotus Aftermarket Is in Trouble," essay, Jul 148

LOTUS FREELANCE PLUS
Japanese version, Jul 10
Rel. 3.0, about, Jan 101, Feb 24
Rel. 3.0, Bitstream Fontware Starter Kit, May 109, Jun 20
Rel. 3.0, new output-device drivers available, Aug 20
Rel. 3.01, reduced-memory version, Sep 22

LOTUS HAL
features incorporated into *1-2-3* Rel. 2.2/3, Oct 17
overview, Mar 36

LOTUS MAGELLAN
about, Feb 24, Apr 88, Jun 88
Bonus Viewer Disk, about, Dec 21
Viewer Toolkit, about, Sep 23

LOTUS MANUSCRIPT
books (*see* BOOKS, Lotus Manuscript)
integrating text, tables, and graphs into a document, tutorial, Oct 87
network version, about , Jul 9
Rel. 2.0, about, Mar 93
Rel. 2.1, about, Jun 20, Aug 20

LOTUS METRO
and *Lotus Express*, ROM-card version for NEC UltraLite, Aug 20
and *Lotus Express*, ROM-card version for Poqet PC, Nov 22

LOTUS NOTES
about, Dec 20

LOTUS ONE SOURCE
CD/Investment: U.S. Equities financial database, Dec 22
CD/M&A, merger-and-acquisition database, Oct 17
CD/Networker, about, Jan 17

LOTUS SIGNAL
Rel. 2.1, about, Mar 110

LOTUS SPREADSHEET FOR DESKMATE
about, Sep 22, Dec 21

MACINTOSH. *See* COMPUTERS, Macintosh

MACRO-CONVERSION AID
Symphony add-in for converting *1-2-3* macros, about, Nov 41

MACRO LIBRARY MANAGER
about, s: May 40
to create address list, o,s: Sep 44
deleting a macro-library file, s: Jan 27

MACROS, GENERAL
autoexecuting, preventing from running during debugging, o: Oct 25
AutoKey macro-entry keypads, Jul 19
{BRANCH} command, alternatives, o,s: Dec 32
@CELLPOINTER in, s: May 36
commands, new developments in *1-2-3* Rel. 2.2/3, Nov 28
converting *1-2-3* macros for *Symphony*, Nov 41
copying macros, o: Apr 31
cursor-movement commands within, o,s: Feb 80
{DEFINE} command, using to create a macro toolbox, o: Sep 32; @ERR, Nov 6
editing, o: Nov 32
{FORM} command, new in 1-2-3 Rel. 3, Dec 73
function keys, incorporating into, o: Feb 36
{GET} command, about, o: Aug 25
{GETNUMBER} command, using, o,s: Jan 67, Feb 76
hiding, o,s: Mar 84
invoking add-ins, o: Oct 25
key indicators for cell-pointer movement, using formulas in, o,s: Mar 91
keywords for file management, o: Apr 30
{LET} command, using for copying operations, o: Sep 38
loops, stopping, o,s: May 91
macro-based viruses, Sep 9
macro-controlled templates, designing, o,s: Apr 40
Macro Library Manager (*see* MACRO LIBRARY MANAGER)
macro names, assigning, o,s: Nov 47
making crashproof, s: Nov 44
{MENUBRANCH} command, alternatives, o: Oct 22
{OPEN} command, about, o: Jun 26
{OPEN} command, using Append parameter, o,s: Aug 78
software (*see* SOFTWARE, macro/programming)
vs. formulas, o,s: Sep 81
writing, introduction to, o,s: Nov 46
writing tips, Jul 30
/XN command, o,s: Jan 67
see also APPLICATION DEVELOPMENT

MACROS, SPECIFIC
annotating cells, o: Mar 34 (@ERRS, May 7, Jun 7); s: Nov 41
assigning range names to cell addresses in other worksheets, o,s: Mar 82
avoiding crashes by shifting control, s: Jul 37
balancing checkbooks, o: Jun 36
calculating life span in years, months, and days, s: Feb 35
concatenating labels, s: Jan 27
converting labels to values while saving memory, s: Jan 26
converting values from base 8 to base 10, o: May 32
converting worksheet data, s: Jan 24
copying cells, o: Sep 38
creating a disk-based database, o: Apr 27
creating a menu system, o: Oct 22
creating an address list, o,s: Sep 44
creating an appointment book, o: Jun 82, Nov 6
creating form letters, o: Aug 38
date-stamping worksheets, o,s: Jun 106
dating, computing, and labeling transactions, o: Sep 36
displaying graphs, o: Mar 90, May 33
editing a header, o,s: Jun 102
editing an existing macro, o: Nov 32
entering dates, o,s: Jun 106
filling in numbers between two numeric endpoints, o: Feb 28
generating data queries, o: Dec 28
generating one-way what-if tables, o,s: Feb 32
generating two-way what-if tables, s: Mar 28
inserting a decimal point, o: May 32
inserting print attributes, s: Aug 80
keeping the cell pointer at destination range after copying, o,s: Aug 73
keystroke-capturing, o: Aug 24
making multiple copies of a range without respecifying source, o,s: Oct 82
moving a column or row, s. Feb 34
moving from formula cell to referenced cell, o,s: Jul 127
moving the cell pointer, o,s: Apr 35
passing control to an external program, o: Jan 20
printing mailing labels, o: Nov 97
printing multiple copies, o,s: Oct 76
printing numerous worksheets automatically, o: Feb 29
printing ranges when one column has several widths, s: Dec 90
print-settings, o: Mar 60
recalculating a named range or specific cell, o,s: Sep 101
recalculating matrix operations, o: Apr 70
recording and reproducing the display, o: Feb 26; @ERR, Jun 7
retrieving a file, o,s: Aug 78
saving graphs, o: May 34
setting and clearing worksheet titles, o: Jan 29, May 6
summing columns, o,s: Nov 46
typing test, s: Sep 40
updating @SUM with variable start/end cells, o,s: Feb 76

THE 1989 LOTUS INDEX

MAILING LABELS
eliminating zeros when printing from database, s: Jul 114
printing (macro), o: Nov 97

MANUFACTURING
overhead allocations, calculating, o,s: May 55
production-data model, o: Dec 38
software (*see* SOFTWARE, manufacturing)

MARKETING
software (*see* SOFTWARE, marketing/sales)

MATHEMATICS
calculating factorials, o,s: Jun 105
determining the root of a number, o,s: Dec 85
matrix operations, recalculating (macro), o: Apr 70
operators in worksheet formulas, about, o,s: Sep 74
Steve Wolfram: "Making Advanced Mathematics Understandable," Feb 18

MEDICINE
software (*see* SOFTWARE, medicine)

MEMORY
in 80286 vs. 80386 machines, Oct 6
chips, Chips and Technologies 82C631 expanded-memory, May 24
chips, end of shortage and prices lower, Apr 15
chips, IBM's 4-megabit, Oct 16
conventional, regaining in a blank worksheet, o,s: Jan 65
crashes caused by colliding virtual-control programs, Sep 18
DOS extenders break 640K barrier, Jun 10
expanded, about, Oct 80
flashing *Mem* indicator, determining cause, o,s: Feb 82, Feb 84, Jun 106
limit in Lotus software, o,s: Apr 72
loss, reducing after label conversion (macro), s: Jan 26
malfunctions cause parity-check errors, May 84
network "RAM cram," ways to alleviate, Dec 8
saving files when low on RAM, o,s: Jun 98
software (*under* SOFTWARE, *see* disk cache, memory management)
use of by deleted columns, o,s: Jun 98

MENUS
command, about, o: May 26
creating (macro), o: Oct 22

MICROPROCESSORS
80286 vs. 80386, Oct 6
Intel's i486 vs. 80386, Aug 8, Dec 4
"William Rash on Intel's Next-Generation CPU—The i486," Jul 18

MICROSOFT CORP.
battles Lotus for spreadsheet market share, May 12
developing new font standard with Apple, Dec 11

MODEMS
9,600-bps, Nov 18
problem using with mouse, s: Nov 99
Switch Model A-1, eliminates separate dedicated modem/phone lines, Sep 118
WorldPort 2496 modem and fax combination, Mar 108

MONITORS
LCD, Jun 18
Xerox Panorama and XGA card, Apr 96
see also DISPLAY

MUSIC
MusicWriter on-line sheet music database, Sep 20

NETWORKS
applications for (*see* SOFTWARE, groupware)
CD/Networker, about, Jan 17
IBM Token-Ring LAN, problem printing, o: Sep 101
LAN software, competition between Novell and 3Com Corp., Apr 9
network versions of *1-2-3* Rel. 2.2/3, about, Oct 18
network versions of Lotus programs, about, Jul 9
"RAM cram," ways to alleviate, Dec 8
software (see SOFTWARE, network)

NUMBERS. *See* DECIMALS, MATHEMATICS, VALUES

OPERATING ENVIRONMENTS
Microsoft Windows 3.0 vs. Presentation Manager, Sep 12
software (*see* SOFTWARE, operating environment)
Unix, agreement between Lotus and Sun Microsystems, Sep 23

OS/2
competition with Unix in PC market, Jul 12
lack of applications, Apr 12
problem installing Microsoft OS/2 Software Development Kit on PS/2 Model 80, Mar 92
running DOS programs under, Mar 11
software (see SOFTWARE, OS/2)

PAGE-DESCRIPTION LANGUAGES. *See* DESKTOP PUBLISHING

PAGINATION
automatic page breaks on HP LaserJet, o,s: Jun 104
manually advancing paper causes incorrect page breaks, o,s: May 83
page-break problem on Epson LQ-1050, Apr 76, Dec 91
page-break symbol, using, o,s: Jan 66, Jul 115
starting with page number other than 1, s: Oct 81

PAYROLL
calculating salary increase, o,s: Jul 112
determining percent increase in salaries, o,s: May 59

PERIODICALS
Computer Database Plus, Jun 113
Computer Library, Jan 100
computer newsletters, Feb 17
Data Based Advisor, on-line index, Sep 117
Inside HyperPad newsletter, Sep 119
LOTUS magazine, on-line index, Sep 117

PERSONAL INFORMATION MANAGEMENT
address list, o,s: Sep 44
appointment-book model, o: Jun 82, Nov 6
PC-based alternatives, special report, Jun 77
software (*see* SOFTWARE, personal information management)

PORTABLE COMPUTERS
Agilis workstation, Oct 8
Atari Portfolio, Dec 17
Cambridge Z88, Mar 108
Colby Walkmac/030, May 25
Compaq SLT/286, Jan 94
Dynabook (from Dynabook Technologies Corp.), Oct 9
DynaBook (from Scenario), Aug 97, Oct 9
improvements in, Feb 16
NEC UltraLite, about, Jan 95
NEC UltraLite, Lotus software on ROM cards, Aug 20
Poqet PC, about, Oct 7
Poqet PC, Lotus software on ROM cards, Nov 22
software (*see* SOFTWARE, laptop)
tradeoffs and developments, Aug 66, Oct 7, Nov 4
Zenith SupersPort 286, problem running A View of 1-2-3 tutorial, Aug 82
see also COMPUTERS

PRINTER FONTS
All-in-1, Jun 114
Apple and Microsoft developing new standard, Dec 11
Bitstream Fontware Starter Kit for *Lotus Freelance Plus* Rel. 3.0, May 109, Jun 20
JetFont 12/3 Cartridge, Feb 88
Plotter in a Cartridge, Jun 114
see also SETUP STRINGS

PRINTERS/PLOTTERS
"Bruce Thatcher Predicts a Boom in Color Printing," Nov 14
Canon BubbleJet, May 100
DEC LA50, printing high-density graphs, Apr 73
drivers (*see* DRIVERS)
Epson EX-1000, problem printing in color, Apr 73, Nov 94, Dec 84
Epson FX-100, printing with variable spacing, o,s: Feb 84, Jul 125
Epson LQ-1050, page-break problem, Apr 76, Dec 91
Fujitsu RX7100PS laser, Sep 118
Genicom 3404, determining emulation mode, Nov 99
guidelines for buying, Mar 54
HP 7470A, producing darker graphs, o,s: Mar 91
HP 7475A, problem plotting graphs, Feb 76
HP 7550A, problem printing graphs, Feb 84
HP DeskJet, May 100, Aug 4
HP LaserJet, automatic page breaks, o,s: Jun 104
HP LaserJet, ejecting paper, Mar 91
HP LaserJet, producing underscores, o,s: Feb 80, Oct 84

HP LaserJet Plus/Series II, printing worksheets, o,s: Mar 68
HP LaserJet Plus/Series II, specifying fonts, Mar 71
HP PaintJet, Jan 82
IBM Quietwriter, line-length problem, o,s: May 90
initialization strings (*see* **SETUP STRINGS**)
laser, new models less expensive, Dec 9
laser, paper requirements, Sep 17
portable, latest developments, Oct 9
printer-sharing devices, about, Sep 16
setup strings (*see* **SETUP STRINGS**)
Toshiba P351C, avoiding printing in draft mode, s: Jul 126
Xerox 4020 Color Ink-jet Printer, Jan 82

PRINTING
border rows/columns, avoiding duplication, o,s: Jul 127
column headings on each page of report, o,s: Dec 86
DOS PRINT command, to print ASCII/PRN files quickly, Mar 92
erroneous characters in reports, cause, o,s: May 82
footers (*see* **HEADERS/FOOTERS**)
form letters, from a database, o: Aug 38
from parallel ports, problem with Compaq 286/386, May 90
headers (*see* **HEADERS/FOOTERS**)
on letterhead, problem, o: Sep 94
margins, suppressing top and bottom, o,s: Apr 71
multiple copies (macro), o,s: Oct 76
multiple copies, o,s: Jul 126
noncontiguous worksheet columns, o,s: Apr 71
noncontiguous worksheet rows, o,s: Dec 84
numerous worksheets automatically (macro), o: Feb 29
paper-feed problem, o: Jun 96
print attributes, inserting (macros), s: Aug 80
print margins, setting, o,s: Apr 76
Print range, determining width, o,s: Mar 84
print settings, storing as macros, s: Mar 60
Print settings sheets, naming, s: Nov 97
problem with IBM Token-Ring LAN, o: Sep 101
ranges when one column has several widths (macro), s: Dec 90
software (*see* **SOFTWARE**, printing/report generation)
underlines, right-aligning, o,s: Nov 90
underlining characters in a cell, o,s: Mar 84, Nov 94, Dec 84
worksheet frame, o,s: Nov 88
worksheets, special report, o,s: Mar 53
see also **DRIVERS, HEADERS/FOOTERS, PAGINATION, PRINTER FONTS, SETUP STRINGS**

PROGRAMMING LANGUAGES
BASIC, current use, Oct 16
object-oriented, about, Nov 16
see also **STRUCTURED QUERY LANGUAGE**

PROJECT MANAGEMENT
software (*see* **SOFTWARE**, project management)

RANGE NAMES
assigning to cell addresses in other worksheets, o,s: Mar 82
deleting in extracted files, o: Dec 87
displaying, o,s: Apr 72
in formulas, maintaining reference when changed or deleted, o,s: Nov 97
producing full-screen list with GOTO and NAME keys, o,s: Oct 80
using, fundamentals, o,s: Dec 48
using in criterion formulas, o,s: Feb 72

RANGES
Criterion, selecting records with blank fields, s: Nov 94
Criterion, specifying multiple, o,s: Jun 98
formula references, avoiding disrupting when inserting rows, o,s: Dec 86
Print, determining width, o,s: Mar 84
printing when one column has several widths (macro), s: Dec 90
protecting, o: Feb 78
Range Unprotect, to locate formula cells, o,s: Jul 127
sum ranges, changing, o,s: Oct 80

REAL ESTATE
closing statements, producing, o,s: Mar 41
home ownership, determining profitability, o,s: May 76, Sep 6, Oct 4
software (*see* **SOFTWARE**, real estate)

RECALCULATION
forcing beep to signal end, o,s: Jun 102
of a named range or specific cell (macro), o,s: Sep 101
of a single cell, o,s: May 90
of a specific range, o,s: Mar 92
of worksheet matrix operations (macro), o: Apr 70

REFERENCE
GuideCard Set for Lotus 1-2-3, Sep 118
GuideCard Set for Lotus Symphony, Sep 119
software (*see* **SOFTWARE**, reference)
Webster's New World Dictionary of Computer Terms, Apr 97

ROUNDING
columns of numbers, o,s: Sep 94
to nearest five dollars, o,s: May 82
to nearest hundred, o: Oct 25
to nearest quarter, o: Oct 25
@ROUND, to correct errors in @IF cross-checking formulas, o,s: Apr 74

SALES
software (*see* **SOFTWARE**, marketing/sales)

SCANNERS. *See* **INPUT DEVICES**

SCIENCE/ENGINEERING
software (*see* **SOFTWARE**, science/engineering)

SETTINGS SHEETS
database, switching between Form and Sheet, s: Dec 90

SETUP STRINGS
to avoid printing in draft mode on a Toshiba P351C, s: Jul 126
embedding in worksheet, o,s: May 85
Epson FX-100, printing with variable spacing, o,s: Feb 84, Jul 125
Epson FX-286, underlining rows, o,s: Feb 84
invalid, cause erroneous characters in report, o,s: May 82
table, o,s: Mar 64
using, o,s: Mar 63, Jun 6 (@ERR, Jun 7); Sep 7, Nov 6

SIMULATION
spreadsheet-based, creating, o,s: Jan 59

SOFTWARE
accelerator:
  dBoost for *dBase*, Apr 92
accounting:
  AccLink, Feb 97
  Allocate, Feb 97
  Andrew Tobias' Checkwrite Plus, Jan 98
  Bottomline-V Version 3.1, Feb 102
  Business Success Programs, Feb 97
  D. MacKay & Associates Small Business Accounting Package, Jul 143
  FASB95, Jul 143
  On the Money!, May 108
  PPS Audit Sampling, Dec 104
  Ready-to-Run Accounting, May 92, Aug 4
add-in:
  for *1-2-3*, compatibility with Rel. 2.2/3, Nov 10
advertising:
  Advertising Edge, Oct 101
animation:
  about, Apr 17
attitude survey:
  PC/Stargraph, Apr 92
budgeting:
  1-2-3 national-budget model, May 24
  The Budget Express, May 106
  What-If Analyst, Aug 96
business correspondence:
  The Instant Business Letters System, Sep 117
business management:
  Forest & Trees, Aug 95
  Worksheets-On-A-Disk, Dec 104
CASE:
  software design and development, Aug 11
communications:
  Communicating Applications Specification–compatible, Oct 16
  Lotus Express, Dec 22
  Mail Server, Jul 136
  PC-Expedite, Jan 100
  PowerDialer, Jul 136
  Send-Off!, May 105
compiler:
  3-2-1 Blastoff, Jul 134
  Compile 1toC, Apr 86
  Jaguar, Apr 91
  King Jaguar, Apr 91
construction:
  The Builder's Organizer, Sep 117
contract bidding:
  Anaheim Bid, Aug 96
database:
  add-ins, about, Dec 81
  Alpha Four, Nov 104
  Clipper, Apr 84
  Dayflo Tracker, Jun 80
  dBase IV, Feb 95, Apr 82
  FoxBase+, Apr 84
  Reflex 2.0, Oct 100

  Tornado, Jun 80
data compression:
  Pack/File, Nov 116
  Tight'N Up, Feb 100
data retrieval:
  324Link, Jun 114
  @ELOOKUP, Mar 105
data security:
  4-Sure, Feb 98
  FastLock, Nov 116
  Lock/File, Nov 116
  Rescue Me, Feb 100
decision support:
  Decision Pad, Oct 92
desktop publishing:
  color-separation programs, about, Aug 10
  Desktop Manager for *Xerox Ventura Publisher*, May 110
disk cache:
  Flash, Dec 96
  Super PC-Kwik Disk Accelerator, Dec 96
  Vcache, Dec 96
display:
  SeeMore, Nov 113
  *Symphony Show*Case!*, Nov 116
  UltraVision, Feb 100
education:
  Mastering the GRE, Jul 144
  Mastering the LSAT, Jul 144
employee-scheduling:
  Working Hours, Apr 92
environment:
  Reg-in-a-Box, Jan 18
executive information system:
  about, Apr 51
expert system:
  about, Feb 11
file management:
  Disk/Director, Nov 116
  File/Find, Nov 116
  FindDir, Nov 116
  Lightning Utilities, Feb 100
  The Norton Commander, Jun 88, Sep 105
  PC Librarian, Jun 88, Jun 115
  PC Tools Deluxe, Jun 88
  ReTreeve, Jun 88
  Treeview, Mar 106
  View/File, Nov 116
  ViewLink, Apr 89, Jun 88
  Word/Find, Nov 116
  The Worksheet Utilities, Jun 88
  XTreePro, Jun 88, Sep 105
  see also LOTUS MAGELLAN
file recovery:
  about, Oct 52
  dBase File Recovery, Aug 96
  The Norton Utilities, Apr 80
  Rescue Plus, Apr 80
file translation:
  AutoImport, Jun 114
  Con-F File Conversion Utility, Sep 116
  CrossFile, Jul 143
  DataShuttle, Jan 97
  DBMS/Copy, Apr 91
  dSlice, Jan 97
  Micrografx Passport, Mar 105
  Perfect Complement, Dec 106
  Perfect Complement for Oracle, Dec 106
  Refine, Oct 101
  Reflection, Jan 100
  Slice 1-2-3, Jan 97
  Slice Cut 'n' Paste, Oct 102
  Slice Duet, Jan 97
  Smart Import, Apr 92
  WIC, Dec 106
  Word for Word/XyWrite, Aug 96
  XyWrite/PageMaker Filters, Jul 143
  XyWrite/Ventura Publisher Filters, Jul 143
  Zeno, Mar 105
finance:
  Compare, Aug 96
  Financial @nalyst, Sep 116
  Financial Toolkit, Jan 98
  Loansmart, Feb 97
  Lotus 1-2-3 Business Applications, Feb 24, Mar 106
  WealthBuilder by Money Magazine, Jul 22
firmware:
  about, May 22
forecasting:
  ForeCalc, Dec 104
  Model of U.S. Economic Growth, Sep 117
  Tomorrow, Oct 101
  TrendSetter Expert, Mar 106
foreign-language learning:
  Hanzi Assistant, Feb 22
  TextWindow, Feb 22
  A Tour of Mainz, Feb 22
forms processing:
  about, Jun 12
  Formall, Jun 116
  JetForm Design, Dec 99
  PerForm Designer & Filler, Dec 99
@functions:
  3-2-1 Gosub, Feb 98, Sep 91
  add-ins for *1-2-3* and *Symphony*, Apr 15
  @Ease, Jul 143
  @Library Volume I, Jan 88
games:
  1989's best, Dec 12
  Guardians of Infinity, Mar 18
  Search for the Titanic, Jun 18
grammar checking:
  Grammatik III, Jul 130
  Punctuation & Style, Jul 130
  Readability Plus, Jul 130
  RightWriter, Jul 130
graphics:
  Applause II, Dec 103
  Draw Plus, Jan 102
  Graph/Array, Sep 116
  HiJaak 1.1, Feb 102
  HotShot Presents, Jul 144
  ImageStation 4.0, Feb 102
  PFS: First Choice Version 3.0, Jan 102
  PFS: First Graphics, Jan 98
  PicturePak, Jun 116
  PICturePICTure, Jun 115
  Streamline, Nov 20
  see also LOTUS FREELANCE PLUS
groupware:
  about, May 70
  Lotus Notes, Dec 20
humor:
  The Computer Comic, Oct 16
hypertext:
  about, Mar 12
  HyperNotes, Jul 143
  HyperPad, Jul 142
  HyperRez, Jul 142
idea generation:
  IdeaFisher, Dec 92
  Idea Generator Plus, Dec 92
input device:
  MarqPlus, Dec 106
integrated:
  increasing popularity, Feb 9
investment:
  Bond @nalyst, Sep 116
  Bond Portfolio Calculations, Dec 104
  Bond Yield Calculations, Jan 98, Jun 110
  Bond$mart Version 2.1, Jan 102
  Buy-Out Plan, Nov 114
  @Fixed_Income, Jan 98, Jun 110
  Mbs @nalyst, Sep 116
  Momentum, Apr 92
  Mortgage-Backed Calculations, May 108
  @Option, Apr 92
  Option Price Calculations, May 108
  Options 1~2~3: The Pro Series, Apr 92
  Options @nalyst, Sep 116
  The Options @vantage, Personal Version, Sep 116
  Stock Chart, May 109
laptop:
  No-Squint Laptop Cursor, Aug 18
law:
  Personal Lawyer, Jun 116
literature:
  The Riverside Shakespeare, Feb 21
macro/programming:
  101 Macros Plus for 1-2-3, Jan 101
  Keyworks Advanced, Jul 17
  Macromania: Files and Tips for Lotus 1-2-3, May 109
  PRD+, Jul 18
  ProKey Plus, Jul 18
mailing list:
  AccuMail, Jun 116
manufacturing:
  Manuplan II, Feb 100
mapping:
  about, Jan 18
marketing/sales:
  The Instant Sales Letters System, Sep 117
  Pricing Edge, Aug 96
  Target Market Selector, May 108
medicine:
  risks, Feb 19, Jun 6
memory management:
  Above Disc, Sep 108
  AutoSwap, Oct 101
  CHK1-2-3, Nov 22
  Extra, Apr 91
  Extra K for Symphony, Jun 48
  Memory Master, Oct 101
  SoftBytes, Feb 100
  Switch-It, Jul 143
  Trading Places, Nov 114
  Turbo EMS, Mar 110, Sep 108; @ERR, Nov 6
network:
  LAN, competition between Novell and 3Com Corp., Apr 9
  Polymod2, Dec 106
note taking:
  see SOFTWARE, worksheet analysis/documentation

object oriented:
  about, Nov 16
operating environment:
  Desqview, Oct 97
  Microsoft Windows, Oct 97
  Software Carousel, Oct 97
OS/2:
  lack of applications, Apr 12
  outlining features in, Oct 14
personal information management:
  CC7 Computer Calendar, Apr 96
  GrandView, Jun 85
  Info-XL, Jun 85
  options, Jun 78
  see also LOTUS AGENDA
personnel:
  401KPC, Nov 114
  DCPC System, Jun 115
  The Greentree Interview, Aug 18
printing/report generation:
  ACTFast, Oct 102
  Control-P, Jul 143
  Ermasoft EasyFonts, Aug 97
  FormFiller, Feb 98
  Horizontal Plus, Feb 100
  Laser-Ready, Feb 98
  Near Laser NicePrint, Sep 116
  PrintaPlot, Feb 98
  Trading Post, Feb 100
project management:
  Critical Path Project Management, Jun 116
  Project Calc, Mar 98
  Project Calc/Resources, Jul 144
  Project Forecaster/Reporter, Mar 107
  Syzygy, Mar 107
  Time Line, Jan 92; @ERR, Apr 5
public domain:
  about, Jan 50; @ERR, Apr 5
real estate:
  PALA$, Aug 96
reference:
  Microsoft Bookshelf, Aug 90
risk analysis:
  @Risk, Feb 92
  Simulated Solutions, Feb 92
science/engineering:
  CodeCalc Engineering Library, Mar 108
  dBase Stats, Dec 104
  dX, Jul 144
  GB-Stat, Mar 108
  LabPro Automation Management System, Oct 102
  The @Library—Scientific and Engineering Applications, Mar 108, Aug 88
  The @Library—Statistical Applications, Nov 108
  Statistics I: Tests and Estimation, Apr 96
  Statistics II: Modeling and Simulation, Apr 96
  @Stats, May 108, Nov 108
  Stats @nalyst, Sep 116
securities:
  see SOFTWARE, investment
shareware:
  see SOFTWARE, public domain
spreadsheet:
  Lotus and Microsoft battle for market share, May 12
spreadsheet enhancement:
  Allways, Mar 75, Jul 10, Oct 17
  Color Your Spreadsheet, Dec 104
  Impress, Mar 103
  Transition, Jun 114
spreadsheet utility:
  Spreadsheet Toolbox, Feb 90
statistics:
  see SOFTWARE, science/engineering
tax:
  89Watifs, Nov 114
  Andrew Tobias' Tax Cut, Jan 98
  Taxplan91, Feb 98
training:
  see TRAINING
travel:
  PC Flight Guide, Aug 18
word processing:
  Eye Relief, Aug 18
  Microsoft Word Version 5.0, Sep 114
  WordPerfect 5.0, Mar 93
  see also LOTUS MANUSCRIPT
worksheet analysis/documentation:
  about, Apr 81
  Check It Out, Feb 98
  Noteworthy, Aug 80
  Panorama for 1-2-3, Mar 105
  TableTalk, Oct 101
  WAS—The Worksheet Archive System, Oct 102
worksheet linking:
  Look&Link, Jan 97

SOFTWARE SUPPORT
Lotus offers 24-hour telephone support for *1-2-3* Rel. 2.2 and Rel. 3, Aug 20
Lotus Prompt CD, Jan 17, Aug 20
@Once Help-Line, telephone support for *1-2-3* and *Symphony*, Sep 117

SPECIAL REPORTS
1-2-3 Rel. 2.2/Rel. 3, Jul 83
database management, o,s: Dec 63
formulas, o,s: Sep 73
personal information management, PC-based alternatives, Jun 77
printing worksheets, o,s: Mar 53

SPEECH. *See* VOICE

SPREADSHEETS
software (*under* SOFTWARE, *see* spreadsheet, spreadsheet enhancement, spreadsheet utility, worksheet analysis/documentation, worksheet linking)
see also WORKSHEETS

STATISTICS
@D functions, adjusting column-offset number automatically when copying, o,s: Jun 105
@D functions, preventing from calculating labels as zero, o,s: Jul 112
data regression, specifying *X* variables, o,s: Dec 90
generating a list of frequencies, o,s: Nov 88
normal curve, o,s: Dec 56
one-way analysis of variance, performing, o,s: Aug 50
performance ratios, computing and graphing, o,s: Jan 33
software (*see* SOFTWARE, science/engineering)
standard deviation, computing, o,s: Dec 60
two-way analysis of variance, performing, o,s: Nov 66
see also FORECASTING

STRUCTURED QUERY LANGUAGE
database products, Oct 58
history of, Oct 62

SUN MICROSYSTEMS
development/marketing agreement with Lotus Development Corp., Sep 23

SYBASE
development/marketing/distribution agreement with Lotus Development Corp., Nov 22

SYMPHONY
add-ins, attaching automatically, Apr 70
books (*see* BOOKS, Symphony)
bundled with *Allways*, Jul 10
compatibility among releases, Oct 72
copy protection, removing with Lotus *1-2-3* Value Pack, Nov 4
database report-generating features, Dec 77
Macro Library Manager (*see* MACRO LIBRARY MANAGER)
network version, about , Jul 9
Rel. 2.0 Plus, contains *Allways*, Oct 17
Spelling Checker (*see* SYMPHONY SPELLING CHECKER)
*Symphony Show*Case!* software add-in, Nov 116
tips and tricks, May 48, Sep 6
use of expanded memory, Oct 80

SYMPHONY SPELLING CHECKER
justification of DOC window data, preventing, Jan 64
loading from DOS, Jun 94
Select Verify from DOC menu message, clearing, Jan 64

TAX
personal income-tax estimator worksheet, o,s: Nov 50
reform, effect on tax-preparation software, Jan 9
software (*see* SOFTWARE, tax)

TIME MANAGEMENT
time-analysis worksheet, o,s: Nov 82

TOTALS/SUBTOTALS
cumulative totals, creating using absolute references, o,s: Jul 127
summing a column based on a criterion, o,s: Apr 71
summing a range of data containing NA, o,s: Jun 96
summing across rows, o,s: Mar 86
summing columns according to index variables, o,s: Jun 94
summing columns (macro), o,s: Nov 46
summing every *n*th cell in a column, o,s: Jan 71
summing positive and negative values, o,s: Sep 95
summing selected entries in a column, o,s: Apr 71, May 84; o: May 89
totaling several subtotals, o,s: Nov 99
updating @SUM with variable start/end cells (macro), o,s: Feb 76
viewing with CALC key, o,s: Jan 70

TRADE SHOWS
Comdex/Fall '88, Feb 104

TRAINING
Advanced dBase IV Learning System, Apr 96
Indexer for 1-2-3, Jan 102
Individual Training for WordPerfect 5.0, Apr 96
Lotus 1-2-3: Beginning Through Advanced Skills, Sep 118
The Lotus 1-2-3 Learning System, Nov 117
Lotus 1-2-3 Made Easy by Video, May 108
Lotus 1-2-3 Release 3, Volume 1, Nov 116
Lotus 1-2-3 Release 3, Volume 2, Nov 116
Lotus 1-2-3, Volume 1, Sep 118
Lotus 1-2-3, Volume 2, Sep 118
Lotus Agenda: Advanced Features, Jan 102
Lotus Agenda: Introduction to the Personal Information Manager, Jan 102
Teacher in a Box, Level I, Oct 102
Teacher in a Box, Level II, Oct 102
Teach Yourself OS/2, Jul 144
Using dBase IV, Apr 96
WordPerfect 5.0, Volume 1, Sep 118
Your PC..Inside Out, Jan 102
see also BOOKS

UNIX
competition with OS/2 in PC market, Jul 12
Larry Bertram: "What *1-2-3* Users Should Know About Unix," Oct 12

UPGRADE AND EXCHANGE
101 Macros Plus for 1-2-3, Jan 101
1-2-3 Rel. 2.2, Apr 6, May 10
1-2-3 Rel. 3, Apr 6, May 10, Jul 9
4-5-6 Link Version 1.1, May 110
4GL•RoundTrip, upgrade of *RoundTrip*, Aug 98
Agenda for OS/2, Mar 110
Alpha Four, Jul 145
Autocast II/Batch2, Dec 108
Baler Version 5.0, Sep 119
Beyond Word Writer (BWW), Apr 97
BocaRAM/AT Plus memory board, Mar 110
Bond$mart Version 2.1, Jan 102
Bottomline-V Version 3.1, Feb 102, Oct 103; @ERR, Dec 4
CD/Investment: U.S. Equities, upgrade of CD/Investment, Dec 22
Digi-duit! 2.0, Dec 108
Disk Technician Advanced, Mar 110
dQuery Version 2.1, Apr 97
Draw Plus, upgrade of *Windows Draw*, Jan 102
EZ-Forms Executive Version 2.2, Jul 145
EZ-PrintSet Version 1.2, Nov 117
Financial Needs For Retirement 2.0, Oct 103
Forecast!, upgrade of *1,2,3 Forecast*, May 110
Forecast Pro Version 1.1, Jul 145
Graph-in-the-Box Version 2.2, Aug 98
Heavy Duty Word Processor for 1-2-3, Aug 98
HiJaak 1.1, Feb 102
IBM Storyboard Plus 2.0, Nov 117
ImageStation 4.0, Feb 102
InstaPlan Version 2.0, Apr 97
Lap-Link Mac Version 2.0, Feb 102
LaserControl Version 3.4, Jul 146
Lotus Agenda for OS/2, Jan 17
Lotus Agenda Rel. 1.01, Jun 20, Aug 97
Lotus Freelance Plus Rel. 3.0, Jan 101, Feb 24
Lotus Freelance Plus Rel. 3.01, Oct 102
Lotus Manuscript Rel. 2.1, Jun 20, Aug 97
Lotus Signal Rel. 2.1, Mar 110
MacroLok 1.02, Oct 103
MathEdit Version 1.2, Sep 119
Org Plus Advanced, Apr 97
PanaView, upgrade of *Panorama*, Sep 119
PC Paintbrush IV, Aug 98
Personal Finances with Lotus Version 3.0, Nov 117
Perspective Junior, upgrade of *BoeingGraph*, Apr 96
PFS: First Choice Version 3.0, Jan 102
Quicken 3, Dec 108
RightWriter 3.1, Nov 117
@Risk Version 1.5, Aug 98
SlideWrite Plus Version 3.0, Aug 98
SQL Tutor Version 3.0, Jul 146
SuperCalc5, Jul 145
Symphony 2.0 Plus, Oct 17
TaxInterest Version 2.0, Nov 117
TechGraphPad Version 3.1, Jul 146
Tim Berry's Business Plan Toolkit, Apr 97
Turbo EMS, upgrade of *Above Disc*, Mar 110
Volkswriter 4 with Correct Grammar, Jul 146
WordPerfect 5.1, Dec 106

USER INTERFACES
unique, Jan 18

VALUES
converting dollar amount to percentage, o,s: Feb 82
converting formula results to, o,s: Jun 97, Dec 84
converting from base 8 to base 10 (macro), o: May 32
converting labels to (macro), s: Jan 26
cubing, o,s: Feb 72
determining the root, o,s: Dec 85
displaying with leading zeros, o,s: Mar 82
filling a column with list numbers, o,s: Sep 94
filling in between two numeric endpoints (macro), o: Feb 28
see also DECIMALS

VOICE
Voicebox software-control system, Aug 97

WHAT-IF
tables (*see* DATA TABLES)

WINDOWS
COMM (*see* COMMUNICATIONS)
DOC (*see* DOC WINDOW)
FORM (*see* DATABASES)
SHEET, counting words in, o: May 30
SHEET, editing a record found by Query Find, o,s: May 90

WORD PROCESSING
software (*see* SOFTWARE, word processing)

WORKSHEET PROTECTION
deleting rows/columns with global protection on, o: Mar 90
macros, hiding, o,s: Mar 84
password-protecting files, o,s: May 83; o: Feb 57, Oct 25
protecting formulas and other cell entries, o,s: Jul 113
Range Protect, ineffective when used alone, o: Feb 78
software (*see* SOFTWARE, data security)
see also DATA SECURITY

WORKSHEETS
annotating, o,s: Sep 101
blank, regaining conventional memory, o,s: Jan 65
border rows/columns, avoiding printing in duplicate, o,s: Jul 127
column letter, finding, o,s: Jan 68
column widths, setting, o,s: Jan 70, Feb 73
currency default, changing, o: Jul 114
end-of-line characters, manipulating for consistent record length, o,s: Aug 75
enhancing (*see* SOFTWARE, spreadsheet enhancement)
errors, ways to avoid, o,s: Feb 50
finding matching column entries, o,s: Dec 86
flagging differences between values in two columns, o,s: Nov 98
global settings, using, o: Apr 70; Aug 22
hiding and redisplaying columns, o: Feb 78; o,s: May 84
index worksheet, creating, o,s: Sep 68
inserting columns causes *Worksheet full* error message, o,s: Aug 74
inserting rows without disrupting formula range references, o,s: Dec 86
inverting entries in a column, o,s: Jan 66
labels, creating, o: Apr 21
large-scale, designing, Jun 30
memory occupied by deleted columns, o,s: Jun 98
moving a column or row (macro), s: Feb 34
multiple-worksheet applications, o,s: Jun 45
printing (*see* PRINTING)
printing worksheet frame, o,s: Nov 88
recalculating (*see* RECALCULATION)
rudiments, o: Mar 20
software (*under* SOFTWARE, *see* worksheet analysis/documentation, worksheet linking)
tasks, tips, and tricks, o,s: May 48, Sep 6, Nov 60
titles, setting and clearing (macro), o: Jan 29, May 6
transforming into reports using *Allways*, o: Mar 75

ZEROS
dividing zero by zero returns ERR, o,s: Mar 86
eliminating from printed mailing labels, s: Jul 114
leading, displaying decimals without, o: May 88
leading, displaying values with, o,s: Mar 82
replacing with dashes, o: Nov 94
suppressing all in a column but the total, o: Jul 114
suppressing in empty database fields, o,s: Feb 77

PREVIOUS INDEXES

Indexes for each of the years 1985 through 1988 appeared in the January 1986, February 1987, January 1988, and January 1989 issues, respectively.

MORE TIPS ON USING LOTUS PRODUCTS

1-2-3/SYMPHONY

LEAVE FOOTPRINTS IN @IF STATEMENTS

I needed to develop formulas that would be computed only if several different conditions were met. The figure below contains sales figures for January and February and nested @IF formulas in range D2..E5.

The formula in cell D2 is as follows:

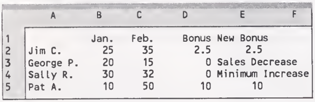
```
@IF(C2<B2,0,@IF((C2-B2)<5,0,
  (C2-B2)*0.25))
```

Copy cell D2 to range D3..D5. The formula compares January and February sales. If February sales are less than January sales, no bonus is given. If sales increase by less than $5, no bonus is given. If the increase in sales is more than $5, the salesperson receives a bonus equal to 25% of the amount of the increase. However, when the formula evaluates to zero, you cannot distinguish which @IF statement evaluated to zero. Enter the following formula in cell E2 to leave "footprints" during the processing of the @IF statement:

```
@IF(C2<B2,"Sales Decrease",
  @IF((C2-B2)<5,
  "Minimum Increase",
  (C2-B2)*0.25))
```

Copy cell E2 to range E3..E5. Now the formula evaluates either to a positive, calculated numeric value or to a text string that tells you the specific condition that prevented the salesperson from earning a bonus. This approach is helpful both in debugging and in making the spreadsheet more useful.

Connie H Koehn
Deere & Co.
Moline, Ill.



	A	B	C	D	E	F
1		Jan.	Feb.	Bonus	New Bonus	
2	Jim C.	25	35	2.5	2.5	
3	George P.	20	15	0	Sales Decrease	
4	Sally R.	30	32	0	Minimum Increase	
5	Pat A.	10	50	10	10	

INVALID RANGE NAMES

With *1-2-3* Releases 2/2.01 and 2.2 and with any release of *Symphony*, you can quickly identify range names that have been invalidated, as well as the location of the valid ranges. *1-2-3* and *Symphony* use the upper-left and the lower-right cells to identify a range name. If you move data into one of these corner cells, or if you delete a row or column that contains one of these cells, you destroy the range name.

To find invalid range names, press slash (in *Symphony*, MENU) and select Range Name Create (or Delete). Press the NAME key (in *Symphony*, the MENU key), and move the cell pointer through the list of range names displayed on the screen.

At the top of the screen, the program will display the location of each range as you place the cell pointer on each range name. In *1-2-3* Releases 2/2.01 and 2.2, invalid ranges will display ERR in place of the range address. In *Symphony*, they will display a blank. When you use the Range Name Table command, *1-2-3* and *Symphony* will remember the range name but won't remember the range address associated with it. Formulas that refer to invalid range names don't refer to either the range name or the range address. Instead these formulas simply display ERR.

Ralph D Sappe
Poughkeepsie, NY

1-2-3 *Release 3 deletes range names that have become invalid.*

EDITING BATCH FILES

I find *1-2-3* useful for creating or editing ASCII files. Because I'm familiar with *1-2-3*, I can edit these files faster and more accurately than I can by using either the DOS COPY CON or the EDLIN commands.

First, let's create a batch file. At a DOS prompt where the root directory is current, enter *copy con fun.bat*. Then enter the following command into this batch file:

```
prompt $p$g
```

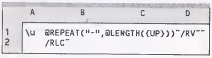
To close the batch file, hold down the Control key, press Z, then press Return. Now load *1-2-3*. To edit your FUN.BAT file, in a blank worksheet select /File Import Text, press Escape once or twice to clear the default path, and enter *c:\fun .bat*. Now you're free to make changes, insert and delete lines, and so forth. After you've edited the file, select /Print File, press Escape once or twice, enter *c:\fun .bat*, and select Replace. Next, select Options Other Unformatted, select Margins Left, and enter 0. Select Quit Range and specify the Print range. Be sure to specify the entire range, including all columns that contain characters, even if they are overflowing from the first column. Then select Align Go Quit to print the file in ASCII format to disk.

Ralph D Sappe
Poughkeepsie, NY.

This also works in Symphony. *To edit an ASCII file, select SERVICES File Import Text and enter a path (if necessary) and a file name. After you edit the file, select SERVICES Print Settings Destination File and enter a path (if necessary) and a file* *name. Then select Margins No-Margins Source Range. Specify the range that you want to be saved in this file, then select Quit Align Go Quit.*

USE MACRO TO UNDERLINE CENTERED LABELS

Here is a macro to underline centered labels. This method inserts the underline with the correct number of underline characters. When you enter the macro, be sure to begin each cell entry with a label prefix and name cell B1 *\u*. Place the cell pointer in the cell where you want the underline to appear. To start the macro, press MACRO-U.



```
      A         B            C         D
1   \u  @REPEAT("-",@LENGTH({UP}))~/RV~~
2       /RLC~
```

Here's how the macro works:

@REPEAT("–",@LENGTH({UP}))~/RV~~ repeats the underline character for the length of the cell that is just above the current cell. This command displays the same number of dashes as there are characters in the label in the cell directly above. Then the macro selects /Range Value and converts the formula of the current cell into its value.

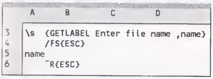
/RLC~ selects /Range Label Center. This creates a centered underline of the same length as the centered label displayed in the cell above it.

Kent L. Hannah
Riverview, Fla.

In Symphony, *edit the macro by replacing each slash (/) with the command {MENU}.*

FILE-SAVE MACRO PROMPTS FOR FILE NAME

The following *1-2-3* macro allows you to save the current spreadsheet under a file name that you specify when the macro prompts you:



```
      A      B          C         D
3   \s  {GETLABEL Enter file name ,name}
4       /FS{ESC}
5   name
6       ~R{ESC}
```

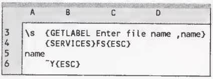
Enter the labels as shown in range A3..B6. Precede the contents of cell B4 with a label prefix. Assign the labels in column A as the names for the adjacent cells of column B: Select /Range Name Labels Right and indicate range A3..A5. Here's how the macro works:

{GETLABEL Enter file name ,name} prompts you for the file name and stores it in *name*.

/FS{ESC} selects /File Save. Then the macro presses the Escape key. If the worksheet had been saved previously, the macro gets rid of its file name. The macro then enters the file name that is stored in *name*.

Anil Kripalani
Glen Rock, N.J.

Here's the Symphony *version of this macro:*



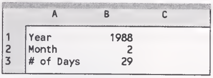
```
      A      B          C         D
3   \s  {GETLABEL Enter file name ,name}
4       {SERVICES}FS{ESC}
5   name
6       ~Y{ESC}
```

FINDING DAYS IN A MONTH

I needed to find a way to calculate the number of days in any given month. The following method does it.

Enter the labels in range A1..A3 and values in range B1..B2 as in the following figure. Assign the labels in column A as names for the adjacent cells in column B: press slash (in *Symphony*, MENU), select Range Name Labels Right, and indicate range A1..A2. Enter the following formula in cell B3:

31–@CHOOSE(month,31,0,
@CHOOSE(@MOD(year,4),2,3,3,3),
0,1,0,1,0,0,1,0,1,0)



```
       A           B           C
1   Year          1988
2   Month            2
3   # of Days       29
```

@CHOOSE(@MOD(year,4),2,3,3,3) calculates the number of days in February by checking *year* to determine if it is a leap year. Leap years are divisible by four. The zeros and ones represent the number of days that must be subtracted from 31 for a given month. Since the @CHOOSE function returns a value starting with *result0*, the second 31 in the formula is a dummy value for placement. The first 0 represents the number of days that must be subtracted from 31 to give you the number of days in January (31).

The section in the formula that reads ,0,1,0,1,0,0,1,0,1,0) represents the number of days that must be subtracted from 31 to give you the number of days in March through December. For example, because March has 31 days, the formula subtracts 0 from 31, returning 31. If *month* equals April, which has 30 days, the formula subtracts 1 from 31.

Ken Poulin
Monson, Mass.

This technique is a clever solution for calculations involving leap years and the month of February.

DOS

USE DOS COPY COMMAND TO COMBINE ASCII FILES

I often use the DOS COPY command to combine ASCII files. I had to combine two files that have the same column heading as the first line of the file. However, I needed only one heading in the combined file.

To correct the problem, I used the DOS EDLIN text editor to remove the heading from the second file before I combined the two files. Listed below are the two sample files, FILE1.FIL and FILE2.FIL.

FILE1.FIL	FILE2.FIL
header	header
data1	data4
data2	data5
data3	data6

The third file, FIX.FIL, has two lines of EDLIN commands.

```
FIX.FIL
1D
E
```

The EDLIN command 1D deletes the first line of a file. The command E saves the file and exits EDLIN.

To remove the column heading from FILE2.FIL and to combine that file with FILE1.FIL to form a new file, FILE3.FIL, I run the following batch file. To create this file called COMBINE.BAT, I enter the command COPY CON COMBINE.BAT, then I enter the following lines:

```
edlin file2.fil < fix.fil

copy file1.fil+file2.fil file3.fil
```

To close the file, I hold down the Control key, press Z, then press Return. The command EDLIN FILE2.FIL < FIX.FIL brings FILE2.FIL into EDLIN's Edit mode. It then directs the command lines in FIX .FIL to delete line 1 in FILE2.FIL, save FILE2.FIL, and exit EDLIN.

The command COPY FILE1.FIL+FILE 2.FIL FILE3.FIL combines the two files into a new file, FILE3.FIL, which appears as follows:

```
header
data1
data2
data3
data4
data5
data6
```

Thomas V. Rakoczy
RNG Associates
Livonia, Mich.

When you create the ASCII files in 1-2-3 *or* Symphony, *make sure that you specify no margins.*

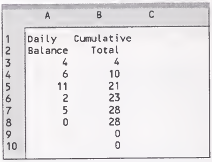
REVISITED

CUMULATIVE TOTALS

Sue Wright's technique [July 1989] for creating cumulative totals by using absolute cell references works well, as long as the number of entries matches the number of formula cells in the column that is set aside for the totals. However, if you copy the formula to ten cells but have data only in the first five dependent cells, then the last five formula cells will all display the same pending total.

To correct this, enter the following formula in cell B3 and copy it to range B4..B10:

```
@IF(@CELL("type",A3..A3)="b",
   0,@SUM(A$2..A3))
```



	A	B	C
1	Daily	Cumulative	
2	Balance	Total	
3	4	4	
4	6	10	
5	11	21	
6	2	23	
7	5	28	
8	0	28	
9		0	
10		0	

The @CELL function allows you to enter a zero, if that's one of the amounts to enter as data. If you prefer to see a blank cell when the dependent cell is blank, substitute a pair of quotation marks ("") for the zero, as in the following formula:

```
@IF(@CELL("type",A3..A3)="b",
   "",@SUM(A$2..A3))
```

Abbott Katz
Richard Bienenfeld & Associates
New York, NY

DOS PRINT COMMAND

In the March 1989 issue, you published a suggestion from Jana Babineau concerning the use of the DOS PRINT command to print ASCII files quickly. You also suggested using the DOS TYPE command. I use the DOS COPY command to print one or several ASCII files. For example, I print the ASCII file named MYFILE.DOC, by entering the following command:

```
copy myfile.doc prn
```

The COPY command, unlike the TYPE command, accepts wild card characters. Thus by using a single COPY command, you can print a group of ASCII files. To print all batch files in a subdirectory named *sub1* on drive C, enter the following command:

```
copy c:\sub1\*.bat prn
```

This technique has one drawback: There is no break between the printed output of each file. To work around this problem, hold down the Control key and press P or press the PrintScreen key after typing and before issuing the COPY command. This activates the printer's echo option. Now the printout will have each file name inserted before the file's contents. The COPY command also prints *1 File(s) copied* and the DOS prompt at the end of the print job. After you finish printing all the specified files by using the COPY command, remember to turn off the printer's echo option by holding down the Control key and pressing P or the PrintScreen key.

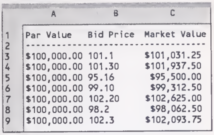
Melvin A. Carter
Gavilan Software
Soledad, Calif.

CALCULATING MARKET VALUE

We received a good deal of mail concerning Donald Uyhazi's formula for calculating the market value of investment instruments that use decimal notation to represent nondecimal amounts [April 1989]. An editing error caused the formula to generate incorrect results. The correct formula should read as follows:

```
@IF(@CODE(@RIGHT(B3,2))=46,
   (((@VALUE(B3)-@INT
   (@VALUE(B3)))/320)+
   (@INT(@VALUE(B3))/100))
   *A3,(((@VALUE(B3)-@INT
   (@VALUE(B3)))/32)+(@INT
   (@VALUE(B3))/100))*A3)
```

To illustrate the usefulness of this formula, Mr. Uyhazi offered an example of bid prices that are entered as labels and that report fractional dollar amounts in thirty-seconds. For this type of bid, a price of 101.2 actually represents $101.0625 (101 dollars plus 2/32 of a dollar), a price of 101.20 represents $101.625 (101 dollars plus 20/32 of a dollar), and so on. The formula uses the @CODE and @RIGHT functions to account for a differing number of decimal places in the price of the bid and to calculate the correct dollar amount. The advantage of such a formula is that it doesn't need to be changed to accommodate different numbers of decimal places in the price.



	A	B	C
1	Par Value	Bid Price	Market Value
2	-----------------	-----------------	-----------------
3	$100,000.00	101.1	$101,031.25
4	$100,000.00	101.30	$101,937.50
5	$100,000.00	95.16	$95,500.00
6	$100,000.00	99.10	$99,312.50
7	$100,000.00	102.20	$102,625.00
8	$100,000.00	98.2	$98,062.50
9	$100,000.00	102.3	$102,093.75

A number of readers wrote in with differing versions of Mr. Uyhazi's formula. However, most of them returned incorrect results. Toronto reader T.B.G. Whitehead submitted the most compact improvement:

```
+A3*((@INT(@VALUE(B3))+
   ((@VALUE(B3)-@INT
   (@VALUE(B3)))/@IF(@CODE
   (@RIGHT(B3,2))=46,3.2,0.32)
   )))/100
```

This material was prepared by Subhadra Mattai and the Technical Editors.

WRITE US

Do you have a favorite technique or way of using your Lotus products or of keeping your hardware and software on speaking terms? Share it! We'll send you $25 if we print your letter. Send them to: Good Ideas, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

Q&A

ANSWERS TO YOUR QUESTIONS ABOUT LOTUS PRODUCTS

1-2-3/SYMPHONY

WHERE ARE MY FOOTERS?

Q. I can't print footers. I use the Print Printer Options Footer command to establish a footer. Then I print a file. The header and text appear in the printout, but the footer does not.

I'm using *1-2-3* Release 2.01, an HP Vectra computer, and an HP LaserJet II. Any clues?

Mary Godwin
Furman University
Greenville, S.C.

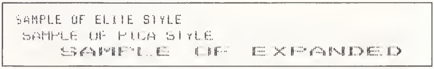
A. Our guess is that your documents result in only one page of output, and that you aren't finishing the print sequence by selecting Page from the Print menu. If you want *1-2-3* to print a footer on the last page of a printout, you must select Page (in *Symphony*, Page-Advance) after you select Go and before you select Quit. *Symphony* users can use the SERVICES Print Settings Page Footer command to establish a page footer.

CHANGING FONTS SEEMS TO ADD SPACES

Q. I did some experimentation after I read "Setup Strings Can Control Printing" in the March 1989 issue. I used an Epson LQ-850 printer to print range A1..C8 of the following worksheet:

```
       A            B            C
1   |\027M
2   SAMPLE OF ELITE STYLE
3   |\027P
4   |\027P
5   SAMPLE OF PICA STYLE
6   |\027W1
7   SAMPLE OF EXPANDED
8   |\027P
```

The printer produced type in three different styles, as follows:



```
SAMPLE OF ELITE STYLE
 SAMPLE OF PICA STYLE
    SAMPLE  OF  EXPANDED
```

As you can see, either the software or the printer inserted extra spaces ahead of the lettering, even though each line of text begins at the very left of column A. This isn't what I had in mind. Any suggestions?

Donald F. Elsmore
Burbank, Calif.

A. Neither the software nor the hardware is at fault. Both printed exactly as they should if your left margin is set at 10 characters. In *1-2-3* you adjust the margin by selecting /Print Printer Options Margins Left.

In *Symphony* you select SERVICES Print Settings Margins Left to set print margins that govern printing from both a SHEET and a DOC window. However, you can also set margins in a DOC window by selecting MENU Format Settings Left. *Symphony* adds DOC-window margin settings to the underlying print margin settings. So if your print margin setting is 4 and your DOC window margin is 6, the total effective margin is 10.

In any case, when the printer expands the size of the characters, it also expands the size of a character space. So a margin of 10 characters in one type style is wider than a margin of 10 in another type style. If you wish each line of output to begin flush with the left margin of the printout, adjust your print settings to a left margin of zero.

MULTIPLE CONDITIONS

Q. How can I make an @IF function dependent on more than one condition? For example, I'd like the condition to be <5 or >10. I can get it to work by using two formulas. One formula eliminates exceptions to the first condition; the second eliminates exceptions to the second condition. However, this is awkward.

Rob Thomson
Patons & Baldwins Canada Inc.
Toronto, Ont.

A. From the wording of your question, it's not entirely clear what conditions you want to set. We'll look at both of the possibilities you've suggested.

Suppose that the value in question resides in cell B2. If you want a condition to return 1, or true, when the value in cell B2 falls between 5 and 10, you must write a mathematical expression that means "B2 is greater than 5 and B2 is less than 10." In *1-2-3* and *Symphony*, the mathematical expression is +B2>5#AND#B2<10.

But what if you want the statement to be true for values outside the range from 5 to 10? You can express this condition verbally by saying that cell B2 is less than 5 or cell B2 is greater than 10. The formulaic equivalent to this expression is +B2<5#OR#B2>10.

PAGE NUMBERS ARE WRONG

Q. I use several macros like the one shown below to print a series of ranges from within a single worksheet. Unfortunately, the header numbers the pages

```
       A         B           C           D
1   \p        /PPRdata~AGP
2             Rdata2~AGPQ
3
4   \s        {SERVICES}PSSRdata~QAGP
5             SSRdata2~QAGPQ
```

starting at one at the beginning of each range.

I'd like the page numbering to be sequential from the first page that prints through the last page, regardless of how many ranges are involved. Is there some way to accomplish this?

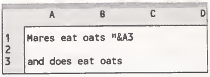
David J. Harries
Tru Circle Corp.
Wichita, Kans.

A. We've added a *Symphony* macro, starting in cell B4 of the illustration, because your question applies to that product as well. The macro selects Align from the Print menu after assigning each Print range. Selecting Align resets page numbering. If you want a macro to print several ranges using only successive page numbers, don't put the Align command in your macro code, except after the first data range.

DO ENTRIES REVEAL A BUG?

Q. I think I've found a bug in *Symphony*. Sometimes I can edit a label entry and build it into a formula, and other times I can't. For example, the worksheet below contains the characters *"Mares eat oats "&A3* in cell A1, and *and does eat oats* in cell A3.

Here's the procedure I used to create the formula: Move the cell pointer to cell A1 and press EDIT Home. Then type a plus sign and press Return. The cursor jumps to the A of the cell address A3 and *Symphony* beeps as though the expression is missing a parenthesis or something. Still, the formula looks identical to successful formulas I've written.



	A	B	C	D
1	Mares eat oats "&A3			
2				
3	and does eat oats			

Rex Clingan
Maryland Heights, Mo

A. The diskette you enclosed revealed the source of your problem. It's a mistake that many users of *Symphony* and *1-2-3* make at least once in a while.

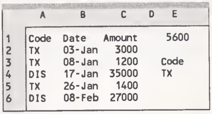
The entry in cell A1 of your worksheet appears to read *"Mares eat oats "&A3*. There should not be a character space following the 3 in the label. If you watch when you press the EDIT key, you'll see that the cursor on the edit line is an entire character width away from the 3. This is your problem. Simply press the Backspace key to remove the errant character, and your editing procedure will become valid. Whenever the spreadsheet won't accept a proper-looking cell entry or returns ERR in *1-2-3* Release 3, check for extraneous spaces. These are the easiest typos to overlook.

SUM CATEGORIES

Q. In several of my spreadsheets, I need to add specific numbers in a column. For example, when posting entries by account code in a monthly ledger, I'd like to add just those records for a specific account. I envision a formula that sums those numbers in a range whose corresponding entries two columns to the right meet a criterion. Is there any easy way to do this?

Francois R. Bigot
John Hancock Mutual Life Insurance Co
Statesboro, Ga.

A. You've just described the @DSUM function. The @DSUM function sums all the values within a column that fall in a category defined by a Criterion range. For example, consider the following worksheet:



	A	B	C	D	E
1	Code	Date	Amount		5600
2	TX	03-Jan	3000		
3	TX	08-Jan	1200		Code
4	DIS	17-Jan	35000		TX
5	TX	26-Jan	1400		
6	DIS	08-Feb	27000		

You'd like to sum the values in column C for every row that contains the label *TX* in column A. First, enter the labels and values shown in range A1..C6. Use the @DATE function to enter the dates in column B and format them as Date 2. Next, establish a Criterion range by copying the label from cell A1 to cell E3. Then enter the label *TX* in cell E4.

Now enter the following formula in cell E1:

@DSUM(A1..C6,2,E3..E4)

The formula returns 5600. You can tally the values associated with the code *DIS* by replacing the label in cell E4 with the label *DIS*.

The @DSUM function has three arguments. The first argument refers to a Database range—including the field names at the top of each column. The second argument identifies which column in the database contains the values to tally. In this case, the second argument is 2. It means "select the column that is two columns to the right of the first column in the range."

The @DSUM function's third argument identifies a Criterion range. The Criterion range must contain a field name that matches a field name in the database. This field name identifies the column that contains the category you want to sum. Enter the label, value, or formula that identifies your criterion in the Criterion range.

1-2-3

FIND SPECIFIC ENTRIES

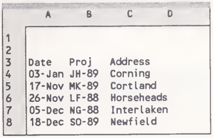
Q. My busiest *1-2-3* file contains information in categories, such as addresses, opening dates, and project locations. Our projects have alphanumeric project codes, such as F08651-89-B-005. I constantly add and remove information from the file, and I need to locate project numbers quickly.

This is a substantial list to cruise through to find one piece of information. Is it possible to find project codes without knowing where they reside?

Martha Smith
All-Climate Guardian Window Co
Gordon, Wis

A. The answer to your question depends upon the layout of the data in your worksheet. If you've entered the information in a *1-2-3* database format, you can find it quite quickly no matter which release of *1-2-3* you're using. If the information isn't in a database format, your best bet is the Range Search command in Release 2.2 or Release 3.

A *1-2-3* database contains information delineated by fields and records. A record typically contains whatever information you want to record about a particular item. In your database this would most likely be all the information about a single project. That information must fall



	A	B	C	D
1				
2				
3	Date	Proj	Address	
4	03-Jan	JH-89	Corning	
5	17-Nov	MK-89	Cortland	
6	26-Nov	LF-88	Horseheads	
7	05-Dec	NG-88	Interlaken	
8	18-Dec	SO-89	Newfield	

within a single row of the worksheet. Each category of information—date, address, and project code, for example—is a field and falls within its own column. The illustration on the previous page shows one possible arrangement of a small database with these three fields.

To find information in a database, you must create a Criterion range, enter a criterion, and issue a Data Query command. To create a Criterion range, copy the database field names to an area above or to one side of the database. To follow our example, enter the labels and dates shown in the figure. Dates are formatted for Date 2. Copy the field names in range A3..C3 to range A1..C1.

Now select /Data Query Input and indicate the entire database (range A3..C8 in this example) as the Input range. Select Criterion and indicate the copied field names and a second row of cells (range A1..C2) as the Criterion range. Then select Find. *1-2-3* highlights the first row of the database.

Press the UpArrow or the DownArrow keys to browse through the records, then press Return to end the Data Query Find operation. Select Quit from the Data Query menu.

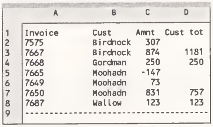
The Data Query Find command should have "found" every record, because you had not assigned a criterion for the command to match. But suppose that you want to find a known project code in the database. Enter the project code in the second row of the Criterion range, directly beneath the appropriate field name. In this case, enter the project code *LF-88* into cell B2.

Now, to find the matching record, simply press the QUERY key (F7 on most computers). You needn't repeat the menu sequence because you've already performed one Data Query Find operation. The QUERY key repeats whatever database operation you last performed via the menus. *1-2-3* highlights the record for the project whose code is LF-88. In this example, the record is in row 6.

Complete the query operation by pressing Return. To find a different project code, enter the new code in cell B2 and press the QUERY key once more.

SUBTOTALING LIKE RECORDS

Q. Take a look at the database in the following illustration. Is there an easy way to add up subtotals of the values in column C for each of the customer names in column B? I'd like the subtotals to appear in column D adjacent to the last entry for each customer.



```
            A               B        C        D

1   Invoice           Cust      Amnt  Cust tot
2   7575              Birdnock   307
3   7667              Birdnock   874      1181
4   7668              Gordman    250       250
5   7665              Moohadn   -147
6   7649              Moohadn     73
7   7650              Moohadn    831       757
8   7687              Wallow     123       123
9   ------------------------------------------
```

Richard Kluchar
Chagrin Falls, Ohio

A. Use the following pair of formulas. In cell D2 of your database, enter the formula @IF(B3<>B2,C2,“”). In cell D3 enter the following formula:

> @IF(B3<>B4,@SUM($C$2..C3)–
> @SUM($D$2..D2),“”)

Copy the formula from cell D3 down column D as needed. This technique won't work in *1-2-3* Release 2 or in *Symphony*.

For these formulas to work, there must be a character entered below the last record. In this example, enter a backslash and a hyphen (\–) in cell A9 and copy it to range B9..D9.

TRANSLATE FROM ONE RELEASE TO ANOTHER

Q. I have both Releases 1A and 2.01 of *1-2-3*. Can I get Release 1A to retrieve files that I have created with Release 2.01? Once I've retrieved them, can I use Release 1A worksheets in *1-2-3* Release 2.01?

Sanjay Jain
Rowley, Mass

A. Release 2.01 of *1-2-3* comes with a Translate utility that converts WK1 spreadsheet files into the WKS format of Release 1A. However, don't expect everything in a Release 2.01 file to translate. The Translate utility converts any formulas that contain Release 2.01–specific @functions into labels. It also truncates any data beyond row 2048. Formulas that refer to any cell or range beyond A1..IV2048 will be invalid.

To use the Translate utility, exit to DOS and make the directory that contains your *1-2-3* program files current. Or insert the *1-2-3* Translate disk in drive A and make that drive current. Enter *lotus* and select Translate, or enter *trans* at the DOS prompt and follow the menus and instructions that appear on the screen.

You don't need to translate files from Release 1A to use them in Release 2.01. Simply retrieve them the way you would if you were using them in Release 1A. For more information on this, see "A Compatibility Guide" in the October issue.

DRIVE ALLWAYS BY MACROS

Q. I bought *Allways* to improve the look of my *1-2-3* Release 2.01 printouts. In the past I've used macros to create the printouts. It would be nice if I could modify the macros to call on *Allways* so that I don't have to switch over manually when I want to use the add-in. In other words, how do I get a macro to "press" Alt-F7? I assume that once *Allways* is active, a macro will be able to control things, just as it does in *1-2-3*.

Robert DePalma
Somerville, Mass

A. When you integrate the *1-2-3* Add-In Manager into your driver set, you automatically incorporate four new macro commands into *1-2-3*. Those commands are {APP1}, {APP2}, {APP3}, and {APP4}. When a macro processes the command {APP1}, it "presses" the key combination Alt-F7. If there is an add-in attached to that key, the add-in becomes active and, as you have assumed, follows the macro's instructions.

The command {APP2} activates an add-in attached to Alt-F8, and the command {APP3} activates an add-in attached to Alt-F9. The command {APP4} presses the key combination Alt-F10, giving your macro access to the *1-2-3* Add-In Manager menu.

Q&A REVISITED

LIMITED SPREADSHEET

The September 1989 Q&A contained a letter from L. A. Meyers who asked what to do about a worksheet that didn't let him insert new rows. You suggested deleting any blank rows that fell below the worksheet data. I suggest a different approach.

Use the File Xtract command to save the file, give the extracted file a new name, and indicate only the worksheet area that contains data as the range to extract. This creates a new disk file. You can retrieve the new, clean file and insert rows as needed.

Scott A. Carson
Indianapolis, Ind.

TAKE FILES HOME AGAIN

The answer to the August 1989 letter *Taking Files Home* explained how to save a *1-2-3* file on a floppy disk in order to take it home. You recommended using the File Retrieve and File Save commands to make take-home copies.

If the files are very large, retrieving them in *1-2-3* or *Symphony* is time-consuming. I prefer to work in DOS when copying files to a floppy disk.

To do this, save your file, then exit *1-2-3* or *Symphony* to get to the DOS prompt.

Once DOS is active, use the Copy command to copy files to your floppy disk. Say, for example, that you want to copy a file named SALES.WK1 from a subdirectory named C:\REPORT. At the DOS prompt enter:

```
copy c:\report\sales.wk1 a:
```

When you finish copying files to take home, return to *1-2-3* or *Symphony* by entering *exit* at the DOS prompt.

When you get home, reverse the commands to copy the file from the floppy disk to your hard disk. For example, to copy the file into a subdirectory named C:\WORKFILE, enter:

```
copy a:\sales.wk1 c:\workfile
```

William F. Sutton
Provident Mutual
Philadelphia, Pa.

HARDWARE

WHAT CONSTITUTES CLEAN?

Q. We've had a personal computer for several years and we haven't cleaned it in any way. What's your opinion about how and how often we should clean it?

Margie Nelson
State Farm Life Insurance Co.
Bloomington, Ill.

A. In general, the only reason to clean the outside of your computer is to keep it looking clean. It's a good idea to get dust out of the inside whenever you have occasion to open the box—when inserting a memory card, for instance.

If dirt really builds up on your keyboard, unplug the system and use an alcohol-based aerosol spray, then wipe clean with a dry cloth. Never use water, which contains minerals that are left behind when it dries. These are often charged particles that can cause shorts.

Dust in the computer's chassis can cause shorts because dust clumps are often charged. You can use compressed air to blow them out.

Hard disks are hermetically sealed, so there's no need to clean them.

The only moving parts that dust might interfere with are in the floppy-disk drives. If you start having intermittent problems while saving and retrieving files, and if you can't determine that software is the cause, consider cleaning the disk drive's read/write heads. There are some drive-head cleaning kits on the market, but they may traumatize the drive as much as they help it. The manufacturer of your computer or a reputable dealership or service center can provide recommendations for cleaning your equipment.

CONTEST

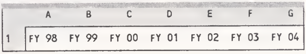
CONTEST RESULTS

In the October issue we asked users of *1-2-3* Release 2 and higher and *Symphony* to submit the best formula to generate fiscal years in the format FY XX across a row in a worksheet. For example, if you enter FY 98 in cell A1, your formula in cell B1 will contain a formula that evaluates to FY 99. We asked readers to make sure that the formula works for the year 2000 and beyond, returning FY 00, FY 01, FY 02, and so on.

Shown below is the winning formula, which resides in cell B1 of the figure that follows the formula:

```
+"FY "&@RIGHT(@STRING
  (@VALUE(@RIGHT(A1,2))
  +101,0),2)
```

In the figure below, cell A1 contains FY 98. Copy cell B1 to range C1..G1. Let's break the formula into five parts:



	A	B	C	D	E	F	G
1	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04

1. **@RIGHT(A1,2)** isolates the string representing the year that's located in cell A1. Let's call the result *a*.
2. **@VALUE(*a*)+101** converts the string to a value and adds 101 to the year value. Let's call this *b*.
3. **@STRING(*b*,0)** converts the value to a string with zero decimal places. Let's call the result of this formula *c*.
4. **@RIGHT(*c*,2)** isolates the last two digits of the string representing the year. Let's call this result *d*. This step is necessary because adding 101 to the year value (step 2) means that step 3 will always return a three-digit string. The constant 101 becomes important for FY 01 through FY 09. Using 1 rather than 101 as the constant would result in FY 1, FY 2, and so on, which isn't the result specified in the contest.
5. **+"FY "&*d*** concatenates the string "FY " with the two-digit string representing the year.

Winning entries were submitted by the following readers: Ron S. Allen, Denver, Colo.; Bill Barney, Appleton, Wis.; Steve Bell, Berwyn, Ill.; Jennifer I. Birnbaum and Robert A. Norton, Jr., Philadelphia, Pa.; Edmund M. Coleman, Jr., Winston-Salem, N.C.; Edward J. Cottrell, Hendersonville, N.C.; John Dempsey, Endicott, N.Y.; William H. Drennan, Cedar Rapids, Iowa; Joe Eldridge, South Yarmouth, Mass.; William Germino, Waltham, Mass.; Britt R. Gregory, Alva, Okla.; Sean Henry, Plano, Tex.; Mike Lewis, St. Paul, Minn.; George Macke, Houston, Tex.; David Miller, Ponca City, Okla.; J. Scott Million, Dallas, Tex.; Tom Newhouse, Grand Rapids, Mich.; William C. Quinton, Corpus Christi, Tex.; Barbara Romine, Humble, Tex.; Joseph W. Smith, Cincinnati, Ohio; Dale L. Sorden, Milwaukee, Wis.; Charles B. Stott, Tucson, Ariz.; Gary Thomas, Midland, Tex.; Diane Tverberg-Bina, Bloomington, Minn.; Ken Winter, Cherry Hill, N.J. ■

This material was prepared by Daniel Gasteiger and the Technical Editors.

WRITE US

Do you have a question? We can't answer every letter, but if yours is selected, we'll publish it along with an answer or a request to other readers for advice. We'll pay $25 for each letter we publish. Send your letters, including your address and daytime phone number, to: Q&A, LOTUS Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.

LOW-COST PROGRAM SWAPPING

AutoSwap and *Dr. Switch* let you load another application when you exit to DOS.

BY BILL LAWRENCE

Many popular applications, such as *1-2-3*, let you temporarily exit to DOS. But once there, you often lack the free memory to use anything other than DOS itself. Using another full-sized application is usually out of the question. That's because when you exit to DOS, the application you exit from remains in conventional memory.

That is, unless you use *AutoSwap* or *Dr. Switch*. When you exit to DOS, these programs move your application and data from conventional memory to either expanded memory, your hard disk, or a RAM disk. That leaves you nearly as much memory as you had before loading your application, so you can run another full-size application.

But before you consider buying *AutoSwap* ($49) or *Dr. Switch* ($59.95), heed the following warning: If you need to switch repeatedly among applications during a work session, you need a more efficient means of switching than *AutoSwap* or *Dr. Switch* provide. Both programs will bog you down, because both require you to start up a second application every time you need to use it and to quit that second application every time you need to return to your original application. Instead, try *Software Carousel* ($89.95, SoftLogic Solutions, Manchester, NH; reviewed in the October 1989 issue) or *Switch-It* ($79.95, Better Software Technologies, Framingham, MA). These programs let you move among applications without restarting or quitting them, so the instant you return to an application, you can continue working exactly where you left off. *Switch-It* also lets you cut and paste data between applications.

The differences between *AutoSwap* and *Dr. Switch* are subtle. *AutoSwap* is less expensive, gives you a bit more memory to work with once you exit to DOS, and in most cases is easier to use than *Dr. Switch*. On the other hand, *Dr. Switch* gives you slightly more memory to use with your original application. It works with a few programs that *AutoSwap* does not support. And if you're a *dBase* or *Foxbase* programmer, you can use *Dr. Switch* to move your *dBase* or *Foxbase* application out of conventional memory automatically whenever a user exits from that application to DOS. *AutoSwap* doesn't give you that capability.

If you're thinking of upgrading from *1-2-3* Release 2/2.01, note that both *AutoSwap* and *Dr. Switch* work with *1-2-3* Release 2.2, but neither works with *1-2-3* Release 3.

STARTING UP

Although *AutoSwap* and *Dr. Switch* yield the same results, they work differently. You start up *Dr. Switch* after you issue your original application's command to exit to DOS. When you start up *Dr. Switch*, it moves your original application and file out of conventional memory. In contrast, you start *AutoSwap* and your original application at the same time. When you issue your application's command to exit to DOS, *AutoSwap* automatically swaps the application and file before it leaves you at the DOS prompt.

It follows that in most cases, *AutoSwap* is easier to use than *Dr. Switch*. To start *AutoSwap* and your original application, you use a special command that's slightly different from the command you use to start the application itself. For example, to start *AutoSwap* in conjunction with *1-2-3*, you enter *as 123* at the DOS prompt. Note that once you exit to DOS, you can start a second application with its regular start-up command.

But *AutoSwap*'s special command imposes one strict and potentially trouble-

KEITH BENDIS

Bill Lawrence is a network engineer based in southern California and the author of Using Novell NetWare *(Que Corp.)*

some requirement: You can use it to start your application only. That means you can't use the special command to start a batch file that, in turn, starts your application. You can incorporate the special command *within* such a batch file if you know how to use the EDLIN command in DOS. But if you don't know the EDLIN command, you have to abandon the batch file or get some help. That help may be particularly hard to find if you load your application from a network. Your network administrator will have to customize the batch file you use to start your application—a job he or she may be reluctant to accept if few others on your network use *AutoSwap*.

WHEN YOU EXIT TO DOS, AUTOSWAP AND DR. SWITCH LEAVE YOU ENOUGH MEMORY TO LOAD A SECOND, FULL-SIZE APPLICATION.

Because you start *AutoSwap* with your original application, it takes up some RAM—about 6K—that you could otherwise use for your data files. But *Dr. Switch* takes up more RAM than *AutoSwap*. So when you start *Dr. Switch* after you exit to DOS, it leaves about 8.5K less RAM than *AutoSwap* does for a second application.

BACK AND FORTH

Dr. Switch doesn't interfere when you load your original application, but its method of moving your applications into and out of conventional memory can slow you down once you exit to DOS. When you quit an application you loaded after loading *Dr. Switch*, the program automatically swaps your original application and file back into conventional memory. If you decide to load a third application, *Dr. Switch* first has to swap your original application and file back out again.

If you set up *Dr. Switch* to swap to your hard disk, these repeated swaps become noticeable delays. Each swap took up to two seconds on my 80286-based computer—not a long time per se, but a surprising lag in a product designed to save time. *Dr. Switch*'s publisher knows a way to eliminate this extra swapping, but you have to call the publisher to find out about it because it's not included in the program's documentation.

In contrast, *AutoSwap* doesn't swap your original application back into conventional memory until you issue the command to return to that application. For example, if you go to DOS from *1-2-3*, *AutoSwap* does not swap *1-2-3* back to conventional memory until you enter *exit* at the DOS prompt. Until that point, you can load and unload applications without delay.

If your original application and data file occupy too much memory, you may not get a chance to use *Dr. Switch*. When I loaded a large worksheet that left only 20K of my memory available (according to the Worksheet Status command), *1-2-3* Release 2.01 could not exit to DOS, and so I could not use *Dr. Switch*. When I repeated this test with *AutoSwap*, it worked just fine. Interestingly, when I repeated this test with *1-2-3* Release 2.2, I was able to exit to DOS no matter how little memory was available, as long as the *Memory full* error message did not appear.

SPECIAL FEATURES

If you like, you can use *AutoSwap* or *Dr. Switch* when you exit from a second application to free more memory for a third application, and so on. Because you have to reload *AutoSwap* or *Dr. Switch* each time you do this, you sacrifice a bit of memory with each successive application—about 6K when you use *AutoSwap* and 14.5K when you use *Dr. Switch*. Also, this is not a practical way to switch among several applications. For example, if you want to go from the third application back to your original application, you must first quit the third and second application. Both *Software Carousel* and *Switch-It* make it much easier for you to switch among two or more applications.

If you use the *dBase* or *Foxbase* programming languages to create database applications for others, you can use a special program (a binary file) that comes with *Dr. Switch* to incorporate *Dr. Switch*'s functionality in those applications. This delivers two benefits to your users. First, they won't have to buy their own copies of *Dr. Switch*. Second, if your application automatically starts *Dr. Switch* whenever your users exit to DOS, they run less risk of running out of memory or freezing their computers when they use another application.

The publishers of both products warned me that some applications can cause all kinds of trouble if you try to swap them from conventional memory after you exit to DOS. Most notable among these are *MultiMate Advantage*, *WordStar* versions 4 and 5, *ProComm*, the *WordPerfect Library*, and Microsoft QuickC and Quick BASIC. *Dr. Switch*'s documentation lists several of these troublesome applications, and the program provides a simple solution to the problem. *AutoSwap* offers no such solution and makes no mention of the problem in its manual.

If for any reason you have to restart your computer after you exit to DOS, you lose whatever data you didn't save before you exited to DOS. *Dr. Switch* provides some protection against this kind of loss. If your computer freezes and you try to restart it by pressing Ctrl-Alt-Del, *Dr. Switch* will instead return you directly to your original application or to the DOS prompt, from which you can return to your original application.

Dr. Switch does not come with a manual: Before you use the program, you must either print or read the documentation from a file on the program disk. Because this documentation lacks pagination and an index, it's harder to use than a manual. The program's publisher promises a preprinted manual by the time you read this review. ■

IN BRIEF

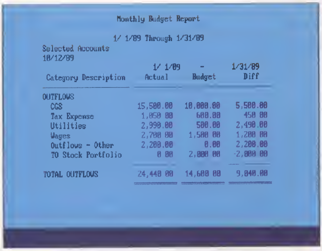
AutoSwap, Version 1.2 The Lambda Group, 555 DeHaro St., San Francisco, CA 94107; 800-USE-SWAP or 415-626-4545. Runs on the IBM PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher and a hard disk, RAM disk, or expanded memory (LIM-EMS 3.2 or higher). Released 6/89. $49. Network version available for $199. 60-day warranty against defective disk; 30-day unconditional money-back guarantee.

Dr. Switch Version 1.6, Black and White International Inc., P.O. Box 1040, Planetarium Station, New York, NY, 10024-1040; 212-787-6633. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher and a hard disk. RAM disk or expanded memory (LIM-EMS 3.2 or higher) optional. Released 12/88. $59.95 60-day warranty against defective disks.

USE YOUR PC TO WRITE CHECKS

A new version of the venerable *Quicken* outdoes *Checkwrite Plus*.

BY DOUGLAS CHING

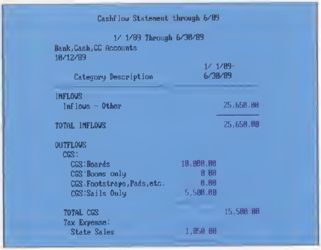


```
                    Monthly Budget Report

                 1/ 1/89 Through 1/31/89
Selected Accounts
10/12/89
                          1/ 1/09      -       1/31/89
 Category Description      Actual    Budget      Diff

OUTFLOWS
  CGS                   15,500.00  10,000.00  5,500.00
  Tax Expense            1,050.00     600.00    450.00
  Utilities              2,990.00     500.00  2,490.00
  Wages                  2,700.00   1,500.00  1,200.00
  Outflows - Other       2,200.00       0.00  2,200.00
  TO Stock Portfolio         0.00   2,000.00 -2,000.00

TOTAL OUTFLOWS          24,440.00  14,600.00  9,040.00
```



```
              Cashflow Statement through 6/09

                1/ 1/89 Through 6/30/89
Bank,Cash,CC Accounts
10/12/89
                                             1/ 1/09-
     Category Description                    6/30/89

INFLOWS
  Inflows - Other                            25,650.00

TOTAL INFLOWS                                25,650.00

OUTFLOWS
  CGS:
    CGS:Boards                   10,000.00
    CGS:Booms only                    0.00
    CGS:Footstraps,Pads,etc.          0.00
    CGS:Sails Only                5,500.00

  TOTAL CGS                                  15,500.00
  Tax Expense:
    State Sales                   1,050.00
```

FIGURE 1. *Quicken* lets you create reports containing just the financial data you want. The budget report (left) includes data from a single budget category; the cash flow statement (right) includes data from all budget and tax categories.

If you write lots of checks, *Quicken 3.0* or *Andrew Tobias' Checkwrite Plus* can take the drudgery out of maintaining your checking account. They all but eliminate mathematical errors, print as many checks as you need with the touch of a key, and make monthly reconciliation a breeze.

If your personal or small-business finances do not require a double-entry accounting system, you can also use either *Quicken* or *Checkwrite Plus* to manage those finances. Both programs let you create budgets, and both let you allocate the amount of a single check or deposit over several budget categories. That helps you keep more-accurate records for financial analysis and tax accounting. Both programs also produce detailed cash flow and budget-to-actual reports.

So which program should you choose? In most cases, you'll be better served by *Quicken*. It makes it easier to review and edit your checks before you print them. The program gives you more ways to allocate your transactions than *Checkwrite Plus*, and it lets you break down your financial data into greater detail. You can set *Quicken* to remind you to pay your bills. And it is a lot easier to learn and to use than *Checkwrite Plus*. *Checkwrite Plus*'s significant advantage, on the other hand, is its loan calculator, which can save you lots of time if you need to include loans or other amortized payments in your budgets.

COMPUTERIZED CHECKBOOK...

When you begin your work, both *Quicken* and *Checkwrite Plus* present you with a form that looks like a blank check. You fill it in just as you would an ordinary check. But that's where the similarity between these programs and your checkbook ends.

The check register Every time you complete one of *Quicken*'s or *Checkwrite Plus*'s check forms, the program automatically enters a record of the check into its register. This simple function prevents you from making the most common check-writing errors: writing the wrong amount in your register or writing nothing in the register at all.

Quicken's register lists every check you've written from your account and indicates which checks have been reconciled and which have yet to be printed. *Checkwrite Plus*'s register includes only unreconciled checks. The program archives your reconciled checks in separate files. This helps you conserve memory and prevents you from confusing reconciled checks with unreconciled checks. On the other hand, if you need to review your records, you have to do some extra work to view reconciled checks.

Editing Both programs let you edit a check before you print it. *Quicken* lets you edit a check either on the check form or in the register. You just move the

Douglas Ching is a planning analyst for a major eastern health organization.

cursor to the data you want to change and type over that data. If you choose to edit check forms, use the PageUp and PageDown keys to scroll through your unprinted forms.

Checkwrite Plus lets you edit on the check form only. However, before you can edit a check, you must first select it from the register—even if that check is your only unprinted check. If you have to make several changes before printing a run of checks, it will take you more time with *Checkwrite Plus* than with *Quicken*. The same holds true if you want to review your check forms before you print them: You're required to select each check, one at a time, from the register.

Reconciliation Both programs make it easy to reconcile your checkbook at the end of the month. You simply check off your checks, withdrawals, deposits, interest, and service charges until your ending balance matches your starting balance.

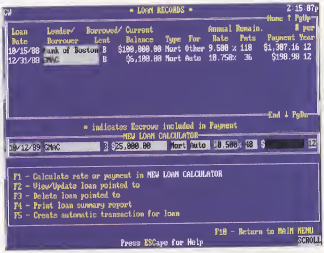
Quicken marks reconciled checks and leaves them in your register. You can view them anytime. In contrast, you can't refer to *Checkwrite Plus*'s archived record of reconciled checks while you write new checks, which is something that many of the users I spoke to wanted to do. You can view archived records separately, but the means for doing this confused some of the users I interviewed.

Buying checks The publishers of *Quicken* offer blank check forms that fit into your printer; the publishers of *Checkwrite Plus* recommend check forms from a company called Deluxe Business Systems. The prices are comparable. For 2,000 two-part voucher checks, *Quicken*'s publisher charges $194.95, and Deluxe Business Systems charges $193.45. For 500 wallet-sized personal checks, *Quicken*'s publisher charges $53.95, and Deluxe Business Systems charges $49.95. Each supplier offers several other types of checks in a variety of colors, as well as window envelopes for mailing your checks. If you have a modem, *Checkwrite Plus* lets you pay your bills electronically by using services offered by Checkfree Corp. (Columbus, Ohio). For more on this company, see page 20 of the December 1988 issue of *LOTUS*.

...AND MORE

To save you work and keep your payments on schedule, both programs go beyond your checkbook's basic function.

Save keystrokes Both *Quicken* and *Checkwrite Plus* let you create templates, or partially filled-in check forms. These templates save lots of time and repeated keystrokes when you make regularly scheduled payments, such as salaries for employees. You merely retrieve the template, fill in the date and any other variable information, and print it out.



```
CW                              * LOAN RECORDS *                          2:15:07p
                                                                   Home ↑ PgUp
 Loan     Lender/      Borrowed/ Current                 Annual Remain.        # per
 Date     Borrower      Lent     Balance    Type  For    Rate   Pmts    Payment Year
10/15/88 Bank of Boston B   $100,000.00 Mort Other 9.500 % 118  $1,307.16 12
12/31/88 GMAC           B     $6,100.00 Mort Auto  10.750%  36    $198.98 12

                                                                   End ↓ PgDn
                   * indicates Escrow included in Payment
                            NEW LOAN CALCULATOR
10/12/89 GMAC           B $25,000.00    Mort Auto  10.500 48 $               12

 F1 - Calculate rate or payment in NEW LOAN CALCULATOR
 F2 - View/Update loan pointed to
 F3 - Delete loan pointed to
 F4 - Print loan summary report
 F5 - Create automatic transaction for loan
                                              F10 - Return to MAIN MENU
                      Press ESCape for Help                           SCROLL
```

FIGURE 2. *Checkwrite Plus*'s loan calculator automatically calculates the monthly payment for any loan when you enter the loan amount, rate, total number of payments, and payments per year.

Payables, receivables Both programs let you create schedules for accounts payable and accounts receivable, and both create aging reports based on these schedules. A glance at the aging report tells you which payments and receivables are due or past due. That can help you pay and collect your bills on time.

Quicken offers an extra feature to keep you current. When you receive a bill or invoice, you can enter a postdated check for the payment. On the appropriate day, when you start *Quicken*, the program will remind you to print the postdated check. If you run a small business, this is an effective way to make sure you recoup any discounts that your vendors offer for early payment.

Allocation Both *Quicken* and *Checkwrite Plus* let you allocate the total amount of a check or a deposit over several categories. This is useful if a single transaction, such as a credit card payment, actually comprises several transactions that you need to track individually for your business or tax accounting. If during one month you use a credit card to purchase airline tickets and storm windows, you can allocate the appropriate amounts into business-travel and home-improvement categories. If a deposit includes your weekly paycheck, a royalty payment, and compensation for unused sick leave, you can allocate appropriate amounts into the proper tax category.

Quicken allows more-detailed allocation than *Checkwrite Plus*. With *Quicken*, you can allocate to subcategories of your budget or tax categories. For example, you can create a utilities category and divide that into subcategories for electricity, oil, and gas.

Quicken also lets you associate any check or allocated portion of a check with a particular project or client. If you're a consultant or contractor who uses your personal checking account in your business, you can track your transactions by job and keep your private and business transactions separate.

FINANCIAL ANALYSIS

Quicken and *Checkwrite Plus* can quickly comb through your checking account records to reveal important information about your finances.

Budgets Both *Quicken* and *Checkwrite Plus* let you create monthly and annual budgets. Within these budgets you can estimate what you want to spend and what you expect to receive in each of your allocation categories.

Checkwrite Plus's budgeting tools include a loan calculator. When you enter the principal, interest, and term of a loan, it calculates your monthly payment and plugs it into your budget. If any data changes, it recalculates the payment, making it easy to play what-if with your budget.

The calculator also automatically allocates your payment among categories such as principal, interest, and taxes and updates the amount in each category every time you make a payment.

Reports Both programs create reports that show your actual performance against your budget. Both also create

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CIRCLE 116 ON READER SERVICE CARD

cash flow statements. You can display these reports on your screen, save them as an ASCII or *1-2-3*–compatible file, or print them on paper.

Both programs let you filter or sort your reports by payee name, budget category, tax category, date, or check number. That means you can get just the information you need, arranged in the order in which you need it. You can quickly generate an itemized report of all your taxable income or a report that shows your actual travel expenses, paid by credit card, for the past month. That's a lot faster than combing through old pay stubs and credit card bills—if in fact you save your pay stubs and credit card bills.

Quicken lets you narrow these reports down even further: You can filter your data by the subcategories just mentioned or by job associations. If you're a consultant, for example, you can generate a cash flow statement for your several jobs and then compare their profitability.

Checkwrite Plus can generate a line graph of your cash flow statement, which allows you to determine your savings or profits at a glance. It also creates pie charts showing your allocation of income and expenses. *Quicken* offers no graphs.

If you're used to *1-2-3*–style menus, you may find *Checkwrite Plus* difficult to learn, and it may be a while before you can use it efficiently. *Checkwrite Plus*'s commands are linked to function keys rather than menus. Each key's purpose changes as you move from one task to the next, so procedures are difficult to memorize. If you use the program frequently, familiarity will overcome those problems. Unfortunately, frequent use can only exacerbate any irritation you feel over the number of steps required to get your work done. ■

IN BRIEF

Quicken 3.0. Intuit, 66 Willow Pl., Menlo Park, CA 94025; 800-624-8742. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher. Released 7/89. $59.95. Unconditional money-back guarantee of compatibility with your printer and monitor.

Andrew Tobias' Checkwrite Plus Version 1.0. Meca Ventures, 355 Riverside Ave., Westport, CT 06880; 203-226-2400. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher and an 80-column monitor. Released 10/88. $49.95. 30-day, money-back guarantee.

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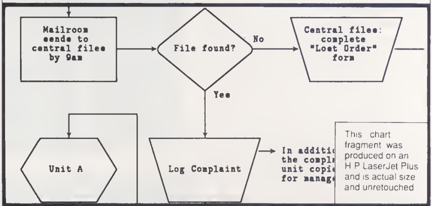
Mailroom sends to central files by 9am
File found?
No
Central files: complete "Lost Order" form
Yes
Unit A
Log Complaint
In additi
the compl
unit copi
for manag

This chart fragment was produced on an H P LaserJet Plus and is actual size and unretouched

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Fast. Written in assembly language for speed.

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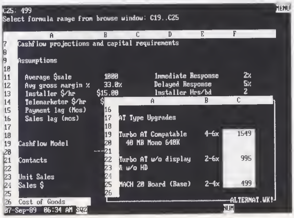
Information: (613) 544-6035 ext. 83
Fax(G3): (613) 544-9632

GOODBYE TO THE FILE COMBINE COMMAND

Look&Link links your worksheet to data from any worksheet on your disk.

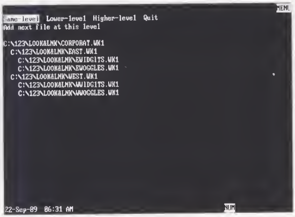
BY TOM CARLTON AND R. MARTIN TEMPLE



```
C25: 499                                                            MENU
Select formula range from browse window: C19..C25

          A               B        C        D        E        F
7   Cashflow projections and capital requirements
8
9   Assumptions
10
11    Average $sale           1000         Immediate Response      2%
12    Avg gross margin %      33.0%        Delayed Response        5%
13    Installer $/hr         $15.00        Installer Hrs/bd        2
14    Telemarketer $/hr      $                A                B        C
15    Payment lag (Mos)       16
16    Sales lag (mos)         17 AT Type Upgrades
17                            18
18                            19 Turbo AT Compatable      4-6x      1549
19  Cashflow Model            20   40 MB Mono 640K
20                         ---21
21  Contacts                  22 Turbo AT w/o display     2-6x       995
22                            23 & w/o HD
23  Unit Sales                24
24  Sales $                   25 MACH 20 Board (Base)     2-4x       499
25                            26
26  Cost of Goods                                        ALTERNAT.WK!
07-Sep-89  06:34 AM SQZ                              NUM
```

FIGURE 1. ***Look&Link*** **lets you load a second** ***1-2-3*** **worksheet in a pop-up window. Within the window, you can use the cell pointer to specify ranges for the program's special @functions.**



```
                                                                    MENU
Same-level  Lower-level  Higher-level  Quit
Add next file at this level

C:\123\LOOK&LNK\CORPORAT.WK1
  C:\123\LOOK&LNK\EAST.WK1
    C:\123\LOOK&LNK\EWIDGITS.WK1
    C:\123\LOOK&LNK\EWOGGLES.WK1
  C:\123\LOOK&LNK\WEST.WK1
    C:\123\LOOK&LNK\WWIDGITS.WK1
    C:\123\LOOK&LNK\WWOGGLES.WK1




22-Sep-89  06:31 AM                                   NUM
```

FIGURE 2. To help you maintain links among several files, you can create an outline describing the dependencies among files. The outline ensures that the worksheets recalculate in the proper order.

If you consolidate worksheets with *1-2-3* Release 2/2.01, *Look&Link* can vastly simplify your work, increase the reliability of your results, and save you time. Suppose, for instance, that you are a regional sales director in charge of 12 retail stores. Each of your store managers hands you a *1-2-3* worksheet containing his or her sales figures for the month. You must compile them into a monthly sales summary.

If you use *1-2-3* Release 2/2.01, you have two ways to complete this task. You can use *1-2-3*'s File Combine command 12 times to copy the data you need into one worksheet. Or you can use *Look&Link* ($99.95) once to link your worksheet to data in your store managers' worksheets. Each month thereafter you can use one command to update your worksheet.

Look&Link uses add-in @functions to link the data in other worksheets to your worksheet. Unlike the File Combine command, which performs a one-time import from another worksheet, *Look&Link*'s @functions are automatically updated every time you recalculate your worksheet.

Look&Link doesn't consolidate just worksheets—it consolidates work. Several of the program's @functions can link a cell in your worksheet to a calculation based on a range of numbers in several other worksheets. And if you need to create a consolidation of several consolidations, *Look&Link* gives you an easy way to make sure your linked worksheets recalculate in the correct order.

While you create your links, *Look&Link* lets you view the worksheet to which you're linking. This is a big improvement over the blind File Combine command. But if you choose to see both worksheets while linking, you sacrifice some of the functionality of *Look&Link*'s primary @function. This is the program's sole drawback, but it's a frustrating one.

A worksheet loaded with *Look&Link* @functions will slow down appreciably. However, in most cases, the time you save building and updating models will far outweigh the longer recalculation times.

If file linking is a major factor in your decision to upgrade your spreadsheet, note that *Look&Link*'s capabilities fall somewhere between the file-linking capabilities of *1-2-3* Release 2.2 and Release 3. In general, a worksheet linked with Release 2.2's native linking function recalculates about as fast as a Release 2/2.01 worksheet that's using *Look&Link*. However, it's easier to create links with *Look&Link*. The version of the program that I tested does not work with *1-2-3* Release 2.2, but a version that does

---

Tom Carlton, a manager of corporate business analysis, and R. Martin Temple, a PC decision-support consultant, work at a midwestern Fortune 500 company.

should be available by the time you read this. In contrast, a linked worksheet created with *1-2-3* Release 3 alone recalculates more slowly than Release 2/2.01 with *Look&Link*, but it's much easier to create links with Release 3.

LINK WITH @FUNCTIONS

Look&Link is composed of two add-ins named, predictably, *Look* and *Link*. *Link* is a collection of add-in @functions you can use to link a cell or a formula to data in other worksheets.

The most fundamental of these @functions, @WKSCELL, returns the value in a specific cell of a specific worksheet. If the value you want is stored in the top-left corner of a named range, you can specify that cell by the range name. If the value you need is in another cell in the range, you can specify that cell by using row and column offset numbers, as you would by using *1-2-3*'s native @INDEX function.

@WKSCELL works most reliably when you use a range name rather than a cell address as an argument. If you refer to data by cell address and then move that data to another cell, your link will return the wrong information. *1-2-3* range names, however, refer to the same data no matter where the range moves. Getting yourself—and others whose worksheets you use—into the habit of storing important data in named ranges is always a good idea but requires some extra work. Note, too, that using named ranges and offsets isn't foolproof. If you expand the named range by inserting a column to the left of the cell you want to link to, or by inserting a row above that cell, @WKSCELL returns the wrong cell and the wrong information.

Link includes four more @functions that return the sum, average, minimum value, and maximum value of a range of values in another worksheet—or in several worksheets—if the data you need in each worksheet resides in a range of the same name or location. If you consolidate worksheets that are organized similarly, these @functions save you from writing a separate @function to analyze the data in each worksheet and then writing your own *1-2-3* formulas to analyze those results. *Link* even gives you a way to refer to a group of worksheets by one name, which you'll appreciate if you often use these @functions with the same group of worksheets.

Oddly, and unlike their *1-2-3* counterparts, these four *Link* @functions don't work with more than one range in the same worksheet. This limitation disappoints when you want to create links to data in a worksheet that isn't organized exactly as you like. As an example, suppose you need to know retailer X's total sales of vendor Y's products. Unless retailer X's worksheet lists product sales alphabetically by vendor, it's unlikely that you can define a single range that contains data for all of vendor Y's products. To get the value you want, you must write a *1-2-3* formula containing several *Look&Link* @functions.

THE FILE-LINKING CAPABILITIES OF LOOK&LINK FALL BETWEEN THOSE OF 1-2-3 RELEASE 2.2 AND 1-2-3 RELEASE 3.

Two more @functions let you use a lookup table stored in another worksheet, which is useful if several of your worksheets depend upon a particularly large lookup table. Another @function lets you know if a single cell in another worksheet is blank or not.

When you consolidate worksheets that are themselves the products of consolidation, *Look&Link* lets you automate the recalculation of all the worksheets involved. You can create an outline that describes the relationship between the worksheets (see figure 2). Then, when you recalculate a worksheet in the outline, *Look&Link* first recalculates all the related worksheets in the proper order. This saves you the time and effort of loading and recalculating each related worksheet yourself, and it reduces the chance of error.

Worksheet links can do more than consolidate data. One user we spoke to used links to ensure the integrity of data used throughout his organization. He maintains a master library worksheet that contains corporate data. If someone in the corporation wants to include that data in a worksheet, he or she creates the appropriate link to the library worksheet. This prevents errors that result from miscommunication or keystroke mistakes.

LOOKING WHILE YOU LINK

The other portion of the program, *Look*, lets you view a second *1-2-3* file through a window that pops up over your current worksheet (see figure 1). You can choose five of *Look&Link*'s @functions from *Look*'s menu: @WKSCELL, and the sum, average, maximum, and minimum functions. The menu also prompts you to enter each @function's arguments, and it lets you use your cell pointer to highlight the cell or range you want to link.

Unfortunately, when you use *Look*'s menu to create a link with @WKSCELL, you cannot specify a cell by row and column offset numbers within a range as you can when you enter the @WKSCELL manually with *Link*. This is frustrating. Even though *Look* makes it easy to view the range containing the cell you want to link to, you still have to write down your offset numbers, switch to *Link*, and enter @WKSCELL manually. These are extra steps—and extra opportunities for error—that *Look&Link* should eliminate.

Look also lets you easily copy data from the pop-up window into your current worksheet. Like *1-2-3*'s File Combine command, *Look* lets you add or subtract copied values from the values in your current worksheet. But *Look* goes one step farther by letting you use your cursor to select the precise range you want to copy. Data copied by using *Look* is not linked with an @function and so will not change when the linked worksheet changes.

When you copy data from a file in *Look*'s pop-up window, you have no way of quickly specifying the entire file or a named range. Instead, you'll have to use the cell pointer to highlight the entire file or the range you want to copy. For this reason, if you want to bring an entire file or a named range into your current worksheet, *1-2-3*'s File Combine command will do so more quickly than *Look*.

PERFORMANCE

The more links you create with *Look&Link*, the slower your worksheet will recalculate. In our tests, a large worksheet took one minute to recalculate without links, and about a minute and a half to recalculate when we linked 50 of its cells to data in two other files.

If you have enough free memory, you can speed up a linked worksheet by

ADVERTISER INDEX

Reader Service Number	Advertiser	Page
—	Ashton-Tate	4–5
—	Ashton-Tate	7
108	Baler Software Corporation	16
110	CalComp Inc.	24–25
—	Dow Jones & Company Inc.	23
114	DynaCorp Inc.	44
124	Frontline Systems Inc.	112
117	Group 1 Software	109
104	HavenTree Software Limited	105
106	Intex Solutions Inc.	13
—	Jesse Jones Industries	9
125	Koh-I-Noor Rapidograph Inc.	43
—	Lotus Development Corporation	32–33
—	Microsoft Corporation	11, Cover 4
111	Output Technology Corporation	Cover 2
105	Park Technologies Inc.	12
113	PC Publishing	29
101	Personics Corporation	21
109	Primavera Systems Inc.	17
107	Quarterdeck Office Systems	15
—	Software Publishing Corporation	37
116	Sony Corporation of America	104
118	Toshiba America Inc.	Cover 3
115	Unison World	56
	QUICK ADS	
119	Best Power Technology Inc.	115
120	Business Forecast Systems	115
121	Lerman Associates	115
122	PLAN Systems International	115
123	Tax Help	115

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NO.	TITLE	PAGE
1	STAFF LETTER	2
2	IDEAS & TRENDS	6
3	@LOTUS	26
4	START HERE Say It with Pictures	28
5	1-2-3 MACROS Macros Can Speed Up Your Work with *1-2-3* Add-Ins	34
6	SYMPHONY MACROS From Table to Form in a Snap	38
7	@WORK *1-2-3* Card File	42
8	FEATURE Making the Best Use of Resources	46
9	FEATURE The Multidimensional Worksheet	52
10	FEATURE Troubleshooting the Installation of Release 3	57
11	FEATURE 11 Time Trials	64
12	FEATURE Calculate Accelerated Depreciation	69
13	FEATURE How to Predict Seasonal Patterns	74
14	THE 1989 *LOTUS* INDEX	81
15	GOOD IDEAS	93
16	Q&A	96
17	REVIEW *AutoSwap* and *Dr. Switch*	100
18	REVIEW *Quicken* and *Checkwrite Plus*	102
19	REVIEW *Look&Link*	106
20	NEW PRODUCTS	110
21	ESSAY Multitasking at Comdex	116

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147
148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189
190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210

EDITORIAL EVALUATION

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22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147
148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189
190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210

EDITORIAL EVALUATION

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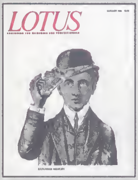

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loading the data to which it is linked. *Look&Link* gives you two ways of doing this. If your worksheet is linked to more than one other worksheet, you can use a *Link* menu command to load and unload other worksheets or a named range within them at the appropriate times. Or you can use three *Link* @functions to create macros that automatically load, unload, and reload worksheets or named ranges as necessary. We were able to knock five to ten seconds off recalculation times by using these @functions in different ways.

LOOK & LINK LETS YOU SPEED-UP LINKED WORKSHEETS BY LOADING THE LINKED DATA INTO MEMORY.

The same linked worksheet took 1 minute 20 seconds to recalculate when we used *1-2-3* Release 2.2. It's worth noting that although *Lotus Speedup*, a minimal-recalculation add-in for *1-2-3* Release 2/2.01, will not affect the speed of *Look&Link*'s @functions, Release 2.2's built-in minimal-recalculation feature may speed up its native linking functions.

However, keep in mind that it takes more time and work to create a linked worksheet when using Release 2.2. You have no way of viewing both files when you create a link. You can't include a link in a Release 2.2 formula, so any formulas requiring linked data must reference the cell containing the link. And Release 2.2 can create a link to a single cell only, which means that in some cases you must create several links, as well as a formula, to do the work of one *Look&Link* @function.

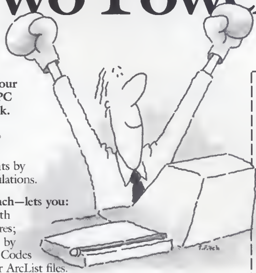
1-2-3 Release 3's file linking imposes the opposite tradeoff. In our tests, *1-2-3* Release 3 took three and a half minutes to recalculate the same linked worksheet. Release 3's optimal recalculation can speed things up a bit in some cases. You can also set Release 3 to recalculate your worksheets in the background, so you can continue to work during a long recalculation.

But Release 3's three-dimensional design makes linking files as easy as writing a *1-2-3* formula. When you want to include data from another worksheet in a formula or @function, you simply refer to that data by cell address. You can view as many as three worksheets at once, and you don't sacrifice functionality for that privilege as you do when you view a file with *Look&Link*'s *Look* program.

If you use *Look&Link* regularly, you'll probably find yourself saving lots of files that you'd otherwise discard. In that case, you'll be happy to know that *Look&Link*'s @functions are compatible with all versions of *SQZ!* and *SQZ! Plus* ($99.95, Symantec Corp., Cupertino, Calif.) except the very first version, *SQZ!* 1.0. ■

IN BRIEF

Look&Link Version 1.04. Personics Corp., 63 Great Road, Maynard, MA 01754; 508-897-1575. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires *1-2-3* Release 2 or 2.01. Requires 55K of RAM for *Look*, 25K of RAM for *Link*, and 22K of RAM for the *1-2-3* Add-In Manager. Released 9/88. $99.95. 30-day money-back guarantee; 60-day warranty on defective disks.



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NEW PRODUCTS

The HP LaserJet IIP: A Price Breakthrough in Laser Printing

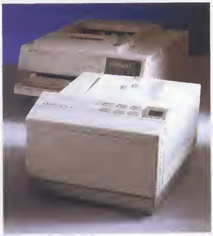
Have you yearned for the crisp output, speed, and quiet operation of a laser printer but been put off by the price? Hewlett-Packard's new LaserJet IIP printer may solve that problem. It offers full LaserJet functionality at a list price of only $1,495.

The IIP (the *P* is for "personal") is very similar to its big brother, the LaserJet Series II, which lists for $2,695. The IIP has the same 300 dot-per-inch print resolution and uses the same command set, soft fonts, and font cartridges. But it contains one, not two, cartridge slots. *1-2-3*, *Symphony*, or any other software that works with the Series II will work with the IIP.

The IIP is slightly smaller than the Series II (as you can see from the photograph to the right), and it weighs significantly less.

The major trade-off required for the IIP's low price is printing speed, which is rated at 4 pages per minute (ppm) instead of 8 ppm. For most individuals and many low-volume shops, that rate is fine.

The IIP comes with both serial and parallel interfaces. The printouts normally come out collated and facedown on top of the machine, as they do in the Series II. You can change to faceup output by attaching an output tray that comes with the printer.



The HP Laserjet IIP is a smaller, less expensive alternative to the Series II.

The standard IIP comes with 512K of memory. It has two memory-expansion slots, and 1-megabyte and 2-megabyte expansion boards are available ($495 and $990, respectively). The fact that the IIP has two memory-based slots is an advantage over the Series II's single slot.

ALSO IN THIS SECTION

BUSINESS, FINANCE 111
UTILITIES 112
TRAINING, REFERENCE............. 112
HARDWARE 113
LOTUS-RELATED UPGRADES 113
OTHER UPGRADES 114
BOOKS........................... 114

The IIP's standard paper tray holds 50 sheets of letter, legal, A4, or executive size paper, or five envelopes. An optional cassette ($195) that will hold 250 sheets of paper fits under the printer. The cassette comes with a letter-size paper tray. Trays for other sizes of paper and for envelopes are also available. When both standard and optional paper trays are installed, the IIP can be used as a dual-bin printer under software control.

Printing envelopes works well, although HP recommends the use of the faceup output tray. When you use that tray, the paper travels along a U-shaped path that bends the paper less than the path it travels for facedown output. (Neither the faceup nor the facedown mode offers a straight paper path.) That could cause more paper jams than a straight-through paper path, and it's a liability when it comes to working with thicker paper. Hewlett-Packard recommends you use no more than 28-pound paper. On the Series II, which uses a straight paper path, you can use up to 35-pound paper.

The IIP can use any of its seven built-in fonts in either portrait or landscape orientation. Six of the fonts are Courier typeface, which is available in 10 and 12 pitch, normal, bold, and italic. The seventh font is 16.66-pitch Line Printer, a small, pellucid font that is appropriate for large spreadsheets. *—Peter G. Aitken*

Hewlett-Packard LaserJet IIP, Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900. Size: 8 inches high, 13.8 inches wide, 6 inches deep (24.9 inches deep with faceup paper tray in operating position). Weight: approximately 22 pounds. $1,495; 250-sheet paper cassette with one paper tray, $195; 1-megabyte add-on memory board, $495; 2-megabyte add-on memory board, $990.

CIRCLE 1 ON READER SERVICE CARD

IBM LaserPrinter: Edging Out the HP LaserJet II

The IBM LaserPrinter's name may be ho-hum, but the machine itself is anything but. Priced at $2,595, or $100 less than the HP LaserJet Series II, the LaserPrinter equals or betters the Series II's standard in every category. Fully compatible with Series II commands, the LaserPrinter is faster, has more built-in fonts, and handles paper better. It is also smaller, lighter, and cheaper to run.

The first thing you'll notice about the LaserPrinter is its small size. With a footprint of 14.2 by 20.5 inches, it takes up less desk space than a Series II's 18 by 19 inches. Most important, you're not giving up anything to get the smaller size.

For most users, the key issue is the print quality—an issue that goes beyond the 300-by-300 dot per inch specification that most laser printers share. For example, the Series II does a better job than most in producing dark, crisp text and graphics with solid blacks. But the LaserPrinter matches its quality, which puts the LaserPrinter in the top tier of laser printers.

At a speed rated at 10 (ppm), the LaserPrinter is also 25% faster than the Series II. The LaserPrinter measured 9 ppm in actual use—20% faster than the 7.5 ppm for the Series II.

Perhaps more significant than the smaller size or faster speed is the advantage in paper handling. The LaserPrinter offers the same basics as the Series II: a 200-page paper tray, a manual-feed capability, an output bin that stacks paper facedown, and an alternate faceup tray. The facedown bin automatically collates the pages. The faceup tray lets you feed envelopes and heavy paper through a straight path to minimize crinkling and the chances for a paper jam.

However, the LaserPrinter goes beyond these basics. As anyone who prints many pages learns, a 200-page tray quickly runs out of paper. The LaserPrinter offers an optional 500-sheet paper tray ($399) and an optional envelope feeder ($329) that lets you load 75 envelopes at a time.

IBM's LaserPrinter meets or exceeds the Series II's print quality and features.

Besides being fully compatible with LaserJet commands, the LaserPrinter emulates HPGL (the graphics language used in HP plotters) and the IBM Personal Printer Data Stream (used in IBM's Proprinter dot-matrix printer).

According to IBM, an Adobe PostScript upgrade will be available in 1990 for the LaserPrinter—at $1,099 for 17 fonts or $1,999 for 39 fonts. The upgrade will be in the form of a user-installable addition to the board inside the printer, rather than a cartridge that uses up a font-cartridge slot.

The LaserPrinter cannot use font cartridges meant for the Series II. Instead, it uses credit card–size font cards. However, it can use fonts meant for the Series II that you can download from your computer to your printer. IBM is offering 47 font cards at $142 to $245 per card, and 12 font packages at $199 each.

One final plus for the LaserPrinter is the cost of running it. The LaserPrinter's $199 toner cartridges are almost twice the price of Series II cartridges. But IBM claims they have a useful life of 10,000 pages per cartridge, which is more than double the number of pages the Series II cartridges print. All things considered, there is simply no reason to choose the LaserJet II over the IBM LaserPrinter.

—Marc Davidson

IBM LaserPrinter, IBM, 800-426-2468. $2,595; 1-megabyte memory add-on board, $449; 2-megabyte memory add-on board, $899; 3.5-megabyte memory add-on board, $1,599; Printer Sharing Option with 6 serial ports, $489.

CIRCLE 2 ON READER SERVICE CARD

BUSINESS, FINANCE

The Eight Most Commonly Used Bond Calculations

Basic Bond Calculations, a *1-2-3* add-in, provides the eight bond calculations most commonly required by analysts and traders, including yield, price, and duration calculations. It handles common types of securities, such as treasury, corporate, and agency bonds.

Requires *1-2-3* Release 2/2.01, 2.2, or 3 and uses 32K of RAM. $395, from Intex Solutions, 161 Highland Ave., Needham, MA 02194; 617-449-6222.

CIRCLE 3 ON READER SERVICE CARD

1-2-3 Add-In for Price/Yield Calculations on Junk Bonds

PIK Bond Calculations, a *1-2-3* add-in, helps bond analysts and traders who work with high-yield and junk bonds to analyze those instruments. The program calculates price and yield on both stepped and stripped payment-in-kind (PIK) securities.

Requires *1-2-3* Release 2/2.01 or 2.2 and uses 32K of RAM. $395, from Intex Solutions, 161 Highland Ave., Needham, MA 02194; 617-449-6222.

CIRCLE 4 ON READER SERVICE CARD

Build Forecasting Models in English; Create Graphs

Business Forecasting lets you build financial-forecasting models using English-like syntax. It lets you perform goal seeking, define custom reports, and create pie, bar, and line charts. It can import data from *1-2-3* and can also import accounting data from *RealWorld Accounting System*.

Runs on the IBM PC, PC AT, PS/2, and compatible computers and requires 512K of RAM (640K recommended), a hard disk, and DOS 3.1 or higher. Works with an 8087 or 80287 math coprocessor. Network version runs with Novell Advanced NetWare, Novell ELS NetWare Level I or Level II, or 3Com 3+ network software. $795 for either the stand-alone or the network version. From RealWorld Corp., P.O. Box 2051, Concord, NH 03302; 800-678-6336, in N.H. 603-224-2200.

CIRCLE 5 ON READER SERVICE CARD

Alternative Bond-Yield Calculations for 1-2-3

Horizon Return Calculations, a *1-2-3* add-in, provides an alternative to the traditional yield calculation, which assumes a fixed-coupon reinvestment rate. In contrast, it presents a scenario in which coupons are reinvested at current rates.

Requires *1-2-3* Release 2/2.01 or 2.2 and uses 32K of RAM. $195, from Intex Solutions, 161 Highland Ave., Needham, MA 02194; 617-449-6222.

CIRCLE 6 ON READER SERVICE CARD

Group-Insurance Sales Tool

Easy Group Pricing Comparisons enables insurance agents to compare the current cost of a client company's group health insurance coverage to as many as five alternatives. The program is designed to assist you in selling to companies that have up to 10,000 employees in the United States and its territories. It lets you consider all types of employee health insurance coverage and associated costs, including retiree and dependent benefits. The program lets you generate a written report that includes graphs that describe all employer costs, as well as the savings of a new plan over the current plan.

Requires *1-2-3* Release 2/2.01 and uses 45K of RAM. $299; site license available. From Successware, 203 Annandale Dr., Cary, NC 27511; 919-469-0119.

CIRCLE 7 ON READER SERVICE CARD

Tax Planning for 'C' Corporations and Their Owners

Vernon K. Jacob's Tax Planner for Closely-Held Corporations allows the owners of an IRS-Subchapter C corporation (a category of corporations that pays taxes

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CIRCLE 124 ON READER SERVICE CARD

and is held by a small number of people) to determine the consequences to the business and to its owners of a variety of tax strategies. You can project taxes either for the corporation, for its individual owners, or for both. The program lets you include two years of historical data, and it projects corporate and individual taxes from tax years 1989 through 1993.

Requires *1-2-3* Release 2.01 or 3. $25; $50 for a detailed manual; $60 per year subscription to *Tax Planning with 1-2-3* newsletter, which devotes a quarter of its contents to this program for closely held corporations. From Research Press, 4500 West 72nd Ter., Prairies Village, KS 66208; 913-362-9667.

CIRCLE 8 ON READER SERVICE CARD

UTILITIES

Preview Your Printout Before the Laser Prints It

PrintVision allows you to intercept the print output from any application that works with an HP-compatible laser printer. It causes a full-page preview of the printout to appear on the screen, including any print attributes you have specified. You can then zoom in on any section of the print preview, return to the worksheet to make changes, or you can print the document.

Runs on the IBM PC and compatible computers and uses 64K of RAM. Requires a CGA, EGA, or VGA board or a Hercules Monochrome Graphics Card and any laser printer compatible with an HP LaserJet Series II printer. $69.95, from Bloc Publishing Corp., 800 Southwest 37th Ave., Suite 765, Coral Gables, FL 33134; 800-888-2562, in Fla. 305-445-0903.

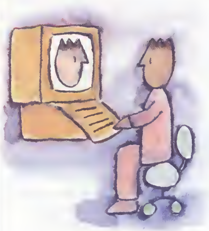
CIRCLE 9 ON READER SERVICE CARD

Format Repetitive Print Jobs for Your Laser Printer

Dan Bricklin's PageGarden Program lets you produce laser-printed reports, forms, and labels from a Lotus database. You can define a format once and use that format for repetitious print jobs. You can include boxes, rules, and bit-mapped images. *PageGarden* works with any ASCII file, so you must first save your worksheet to a PRN file.

Runs on the IBM PC and compatible computers and uses 256K of RAM. $99.95, from Software Garden, P.O. Box 373, Newton Highlands, MA 02161; 617-332-2240.

CIRCLE 10 ON READER SERVICE CARD



Transfer Data into Timeslips

With *Timeslips III Import Manager* (TIM), you can import and export data to and from *Timeslips III* from any application that generates ASCII files. *Timeslips III* performs billing and expense functions. If your copier, fax, or telephone has a cost-collection system that creates ASCII files, TIM can also read that ASCII data into *Timeslips III*. If you can import data from the Macintosh version of *Timeslips* into your PC, TIM will combine that data with the data in your PC. A version of TIM contained in a cartridge fits into the Sharp Wizard computer.

Requires *Timeslips III* ($299.95) version 3.3 or higher. Runs on the IBM PC, PS/2, and compatible computers with 450K of RAM, DOS 2.1 or higher, and a hard disk or high-density floppy disk. $79.95, from North Edge Software Corp., 239 Western Ave., Essex, MA 01929; 508-768-6100.

CIRCLE 11 ON READER SERVICE CARD

TRAINING, REFERENCE

On-Line Microcomputer and Software Directory

The Computer Directory provides basic specifications about more than 55,000 hardware and software products sold in North America and includes profiles of the 9,500 manufacturers of those products. Updated monthly, the directory is based on Ziff Communications' *Data Sources*, which is published semianually. The directory is available through the CompuServe Information Service and on *PC Magazine*'s PC MagNet, which is also on CompuServe.

Requires a PC, modem, communications software, as well as a subscription to CompuServe (800-848-8199, in Ohio or in Canada 614-457-0802). $6 per hour of connect time to CompuServe using a 300-baud transmission rate, $12.50 per hour at 1,200 or 2,400 bauds; $24 per hour of connect time to The Computer Directory. From Ziff Communications Co., One Park Ave., New York, NY 10016; 212-503-4400.

CIRCLE 12 ON READER SERVICE CARD

Disk and Audiotape Training for 1-2-3 Releases 2.01, 2.2, 3

Let's Get Started With Lotus 1-2-3 ($49.95) is a disk-based tutorial and a user guide for beginning to intermediate users. *Listen and Learn* ($69.95) consists of four audiotapes and a 71-page manual for beginning to intermediate users. *The Complete Tutorial Lotus 1-2-3* ($79.95) includes two audiotapes, two disks, and a 50-page manual for beginning to advanced users. All are intended for use with Release 2.01. *The Complete Tutorial Lotus 1-2-3* for Release 2.2 ($79.95) and Release 3 ($89.95) were due out in December.

Each product requires the appropriate release of *1-2-3* and, for the products that are used with Releases 2.01 and 2.2, 512K of RAM. Distributed by Prestige Technologies, 3001 Red Hill Ave., Bldg. 6, Suite 108, Costa Mesa, CA 92626; 714-546-4814.

CIRCLE 13 ON READER SERVICE CARD

HARDWARE

High-Speed Memory Board for IBM Micro Channel PCs

Memoryzation allows you to add up to 8 megabytes of extended or expanded memory per board to all IBM PS/2 Models 50 or higher. You can allocate the board's memory into any proportion of extended and expanded memory, and it comes with a LIM-EMS 4.0 driver. It supports all software applications that are based on DOS, OS/2, OS/2 with Presentation Manager, and Xenix. You can populate up to two boards per PC with 256K modules and 1-megabyte plug-in SIMMs (single in-line memory module). The board's chip speed is 80 nanoseconds.

Requires one available slot per board (two maximum). For 16-bit PCs: $930 for 2 megabytes; $1,515 for 4 megabytes; $2,105 for 6 megabytes; or $2,695 for 8 megabytes of memory. For 32-bit PCs: $730 for 1 megabyte; $1,130 for 2 megabytes; $1,475 for 4 megabytes; $1,875 for 5 megabytes; or $2,625 for 8 megabytes of memory. From Newer Technology, 1117 South Rock Rd., Suite 4, Wichita, KS 67207; 800-678-3726.

CIRCLE 14 ON READER SERVICE CARD

Speed up Your IBM PC XT by at Least Fourfold

The VT286-12 is an accelerator card that speeds up your PC XT to the speed of a '286-based PC. The accelerator card contains an Intel 80286 processor with 8K of 55-nanosecond cache RAM. A switch lets you toggle, as needed, between the PC XT's 8088 native speed and the card's '286 speed. The card is compatible with any application that runs on the '286, including *Microsoft Windows*, and it's compatible with any LAN.

Requires an IBM PC XT or compatible computer with one free half slot. $399, from Veritek, 1205 Linda Vista Dr., San Marcos, CA 92069; 619-744-2313.

CIRCLE 15 ON READER SERVICE CARD

Rechargeable, Sealed Lead-Acid Battery for the IBM PC AT

The bATPac is a battery that can be used for the PC AT and compatible computers and that recharges continuously while your PC AT operates. It is designed to eliminate service calls when the PC AT's clock and other internal configurations have to be reset because of power loss. It runs for up to 12 months as a backup when your PC AT is shut off. According to the manufacturer, the battery can be expected to have a lifetime of 10 years. The bATPac plugs into the PC AT's disk-drive power connector, but also provides a connection for an additional disk drive. The package includes installation instructions.

$39.95, from Rupp Corp., 835 Madison Ave., New York, NY 10021; 212-517-7775.

CIRCLE 16 ON READER SERVICE CARD

LOTUS-RELATED UPGRADES

Symphony Release 2.0 Plus, the integrated software program from Lotus, now includes the *Allways* printing add-in from Funk Software. The documentation for *Allways* has been integrated into the *Symphony* documentation.

Runs on the IBM PC, PS/2, and compatible computers with at least 640K of RAM and a hard disk. $695; $125 to upgrade; both prices include six months of toll-free telephone support. From Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-872-3387.

CIRCLE 17 ON READER SERVICE CARD

Four add-in utilities that come from Goldata Computer Services have been updated to run with *1-2-3* Release 2.2. *D.A.V.E.* (Data Addition, Verification, and Editing) allows you to customize a data form for *1-2-3*, uses 64K of RAM, and costs $99.95. *Worksheet Links* lets you create dynamic links between worksheet data on disk and worksheets in RAM, uses 19K of RAM, and costs $49.95. *S.O.S.* re-creates damaged worksheet files and automatically saves worksheet data to disk at predefined intervals, uses 14K of RAM, and costs $79.95. *@ELookup* lets you perform table lookups on external ASCII files, uses 25K of RAM, and costs $49.95.

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All require *1-2-3* Release 2/2.01 or 2.2. From Goldata Computer Services, 2 Bryn Mawr Ave., Bryn Mawr, PA 19010; 800-432-3267.

CIRCLE 18 ON READER SERVICE CARD

1099Mag Printer and Magnetic Media Filer lets you prepare disk files for IRS forms 1098, 1099 A, B , DIV, INT, MISC, OID, PATR, R, and S, and 5498 and produce the associated returns and transmittals. The 1989 update conforms to new IRS guidelines. Included are these changes: The recipient's account number is now required and is left-justified, and fields have been added in the 1096 transmittal form. When you import fields of data from a *1-2-3* or ASCII file, the software formats the data to IRS specifications. For example, it removes all decimals and dollar signs.

Requires *1-2-3* Release 2/2.01 or 2.2, and the manufacturer recommends that your computer have 640K of RAM. $119; $59.50 to update from the previous year only. From Coopersoft, 2995 Woodside Rd., Suite 400, Woodside, CA 94062; 415-948-6363.

CIRCLE 19 ON READER SERVICE CARD

FinCalc for Release 3 provides a template that helps you calculate time-value-of-money calculations, produces amortization schedules, and performs discounted cash flow analysis. It also provides an add-in that enhances *1-2-3*'s time-value-of-money @functions. It uses 90K of RAM and costs $99.95. *@Ease for Release 3* is an add-in that provides @functions to simplify common worksheet tasks, uses 160K of RAM, and costs $99.95. *@Fixed_Income for Release 3* is an add-in that is a collection of @functions related to fixed-income securities for the bond trader or portfolio manager. It uses 230K of RAM and costs $795.

All require *1-2-3* Release 3. From Spreadsheet Solutions, 600 Old Country Rd., Garden City, NY 11530; 800-634-8509.

CIRCLE 20 ON READER SERVICE CARD

All three versions of *The @Library*, which include @functions related to general business, statistics, and science and engineering, are available as *1-2-3* Release 3 add-ins. *TableTalk* lets you perform matrix algebra and other complex operations on worksheet tables and is also available for Release 3. It provides 30 macro-driven operations.

All programs require *1-2-3* Release 3. All packages cost $79.95; upgrades from packages purchased before July 1, 1989 cost $35; upgrades from packages purchased thereafter are free. From IRG Information Systems, a division of GreyMatter International, 100 North Country Rd., Setauket, NY 11733; 516-689-7682.

CIRCLE 21 ON READER SERVICE CARD

What'sBest! for Release 3 optimizes from 400 to 16,000 worksheet-based variables, depending on which version you buy. All versions require *1-2-3* Release 3. The Personal Version requires 256K; $149; upgrade, $50. The Commercial Version requires 448K; $695. The Professional Version requires 640K; $995. The 386 Version requires 4MB, an 80387 math coprocessor, and DOS 3.0 or higher; $2,995. The 386W Version requires 4MB, a Weitek math coprocessor, and DOS 3.0 or higher; $3,495. To upgrade to each version except Personal Version, $150. A math coprocessor is recommended for use with all versions that don't require one. From General Optimization, 2251 North Geneva Terrace, Chicago, IL 60614; 800-441-2378.

CIRCLE 22 ON READER SERVICE CARD

OTHER UPGRADES

The Norton Commander version 3.0 lets you invoke DOS commands with a single key. The new version allows you to view files that were saved with any of more than 20 major applications, including *1-2-3, Symphony, WordPerfect*, and *dBase*, as well as PCX-formatted graphics files. You can prepare MCI Mail or CompuServe mail messages, attach binary files to the MCI Mail message, and the program will automatically send those files. You can also send faxes. If you have the appropriate cable, you can transfer files between two PCs.

Runs on the IBM PC and compatible computers. $149; upgrade fee of $49 for registered users of any previous version, from Peter Norton Computing, 100 Wilshire Blvd., 9th Floor, Santa Monica, CA 90401-1146; 213-319-2010.

CIRCLE 23 ON READER SERVICE CARD

Aldus PageMaker 3.0 for OS/2 Presentation Manager can do everything *PageMaker* 3.0 can do, plus perform operations in the background and keep multiple documents and multiple applications running at the same time. Requires OS/2 version 1.1; an 80386-based computer; 4 megabytes of RAM; an EGA, VGA, or high-resolution color card and monitor; and a 40-megabyte hard disk. $795; upgrade for registered users of the MS-DOS version of *PageMaker* 3.0, $95 until February 28, 1990. From Aldus Corp., 411 First Ave. S, Seattle, WA 98104; 206-628-2320.

CIRCLE 24 ON READER SERVICE CARD

MAI 4.10 One To Five Year Forecasting Model helps you prepare balance sheets and statements of profit and loss, cash flow, and inventory. It also calculates 31 financial ratios. The new version lets you calculate dividends and produces six kinds of bar charts. The menu system has been expanded and made easier to use.

Requires *1-2-3* Release 1A or 2/2.01, 640K of RAM, and a 132-column printer that has condensed mode. $169.95, from Munier Associates, P.O. Box 79314, Houston, TX 77279; 713-784-4348.

CIRCLE 25 ON READER SERVICE CARD

Lotus 1-2-3: Module I, courseware for instructors teaching beginning students, now covers Releases 2.2 and 3. New topics include using the Undo feature, formatting, and printing.

Requires appropriate release of *1-2-3*. $995 for instructor's outline, disk, transparency masters, and student training guide; free upgrades; quantity discounts available. From ComputerPrep, 1707 East Highland Ave., Phoenix, AZ 85016; 800-228-1027, in Ariz. 602-277-7171.

CIRCLE 26 ON READER SERVICE CARD

BOOKS

Expert Advisor: 1-2-3 Release 2.2, by Mark M. Williams. Alphabetical reference to all features and functions of Release 2.2. Includes a detachable 100-page quick-reference guide. Published January 1990, 550 pages, $22.95 (paperback), from Addison-Wesley Publishing Co., Reading, MA 01867; 617-944-3700.

CIRCLE 27 ON READER SERVICE CARD

Encyclopedia of Lotus 1-2-3, Release 2.2: The Master Reference, by Robin Stark. Indexes and cross-references all of Release 2.2's commands and functions. Published November 1989, 496 pages, $24.95 (paperback), from Windcrest, a division of Tab Books, Blue Ridge Summit, PA 17294; 800-822-8138, in Pa. and Alaska 717-794-2191.

CIRCLE 28 ON READER SERVICE CARD

Lotus 1-2-3 Simplified, Release 2.2, by David Bolocan. Covers all of Release 2.2's features and describes C-language libraries with which to create add-ins. Published October 1989, 272 pages, $16.95 (paperback), from Windcrest, a division of Tab Books, Blue Ridge Summit, PA 17294; 800-822-8138, in Pa. and Alaska 717-794-2191.

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Information for New Products is supplied by the vendors and was up-to-date as of 11/17/89. Since production specifications change frequently, we recommend that you verify this information with a dealer before making a purchase.

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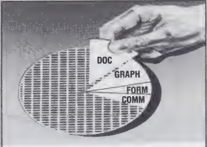

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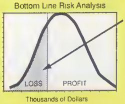

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CIRCLE 123 ON READER SERVICE CARD

MULTITASKING AT COMDEX

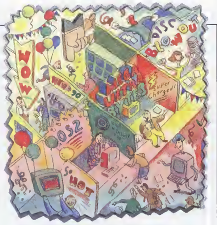
BY MARK SCAPICCHIO

Six months ago I left the Spring Comdex show thinking that OS/2 with Presentation Manager (PM) was nothing more than the world's most expensive printer utility. At the time, few OS/2 applications were actually available. A few developers demonstrated upcoming releases, but whenever I asked a developer to describe how his application would take advantage of OS/2's multitasking capability, I got the same answer: "You can work on your data and print a report at the same time."

Fortunately, at Comdex/Fall '89 it was clear that OS/2 products have come a long way. When I posed my question at the Microsoft booth, for example, I was treated to an enlightening demonstration.

On a computer simultaneously running prerelease versions of *Microsoft Word* and *Microsoft Excel* under OS/2 PM, the demonstrator first created a table in a *Word* document. Then he cut-and-pasted the table to *Excel*, where he created a pie chart from the data. Next he copied the chart back into his document. In the coup de grace, he changed a number in the document's table, and in seconds the graph in his document changed to reflect the new data.

The demonstrator explained matter-of-factly that I'd just seen *Excel*, working in the background, recalculate the table and update the graph. But in my view, what I'd just seen was magic—a word processor serving as a tool for numerical and graphical analysis—a kind of multifunction workpad.



Lotus Development Corp. and WordPerfect Corp. demonstrated a similar application of *1-2-3/G* and *WordPerfect* for OS/2 as they announced plans to closely align their OS/2 PM products. And in a joint IBM/Microsoft announcement, both companies made plain their intention to establish OS/2 PM as their primary development platform, which should end confusion about *Microsoft Windows* and encourage developers to create more software for OS/2 PM.

To me, these endorsements of OS/2 PM and tangible demonstrations of the operating system's multitasking and Dynamic Data Exchange capabilities were breakthroughs. But as you might expect at a show like Comdex, scores of manufacturers and pundits urged us to consider what we might want or need next.

For example, Andy Grove, president and CEO of Intel Corp., described a "chip of the future" to an audience of user-group members. He then passed out paper and asked everyone to write down what they wanted to be able to do with that chip and mail their answers back to him.

The more I thought about it, the more I realized that what folks want next from multitasking doesn't require a new chip at all. It requires a new kind of software.

Specialized applications aside, what most people want from software is to be able to do everything they can do with pencil and paper, only a lot more quickly and easily. Specifically, they want programs that make it easier to write, do math, and create illustrations. For this reason, the *Word-Excel* and *WordPerfect–1-2-3/G* demonstrations represent some of the most powerful personal-computing tools yet.

The next step is to integrate these capabilities into a single program that works just the way a pencil and paper work. Such a program would be unlike any integrated program we've known. It would allow you to switch from typing sentences to working with numbers to creating a graph, without switching programs—even without switching windows. The program would use OS/2 Presentation Manager to handle all the multitasking and dynamic data exchange in the background.

Why bother to create such an application when OS/2 PM enables us to link powerful existing applications? Because although multiproduct applications will attract existing users to OS/2 PM, a single multitasking application has the greatest potential to attract new customers to personal computing.

A single multitasking product would be easier for neophytes to grasp because it works more like the tools they use now—pencil and paper. People don't switch to a different piece of paper when they stop writing and start doing math, so they don't understand why they have to switch programs or windows when they want to stop processing words and start processing numbers. There's also the cost factor: It's cheaper to buy and learn one program than two or three. Given the cost of buying a new computer with multitasking power, that's a big factor.

Comdex/Fall '89 convinced me not only that OS/2 PM will change personal computing but also that OS/2 PM provides the basis for an elusive prize: a single application that lets us work the same way we did before we had computers, only much faster. I hope I see that application at Comdex/Fall '90. ■

Mark Scapicchio is an assistant editor at LOTUS.

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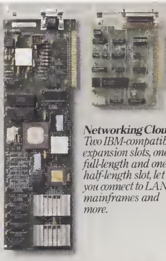

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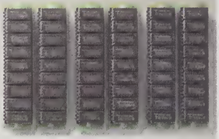

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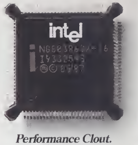

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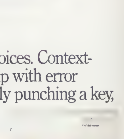

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